Eaton® DuraForce™ HPV

Service Manual

Powering Business Worldwide

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Hydraulic Neutral Adjustment for HPV Pumps

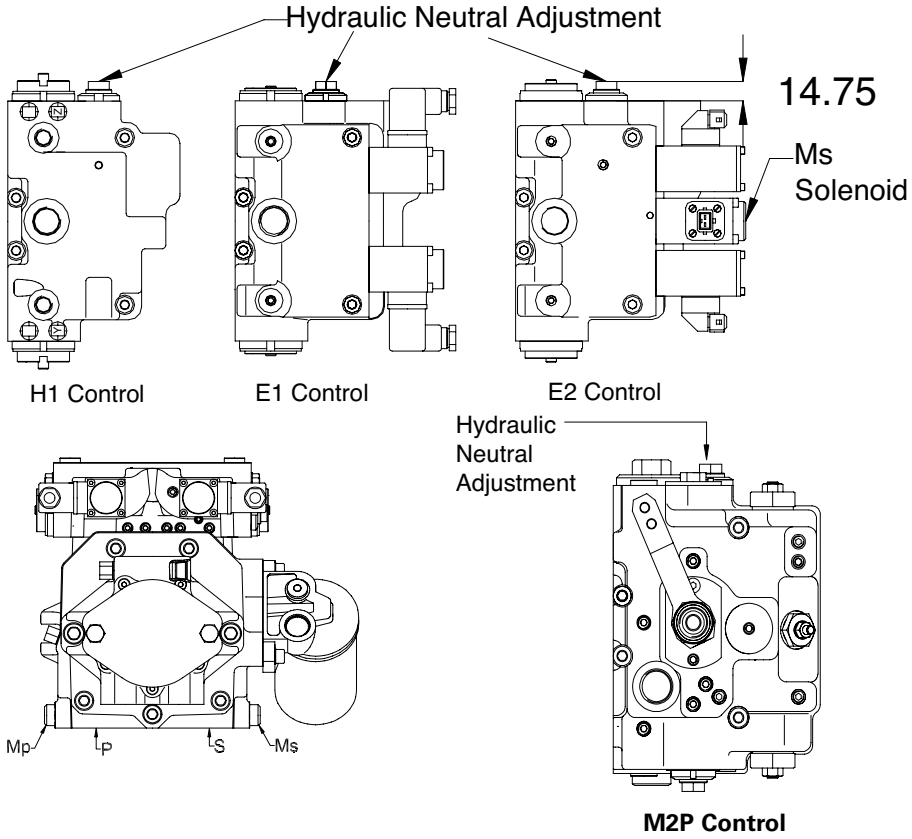
Set Up and Procedure

⚠ Note

This Service Bulletin is valid for HPV pumps controls, except the "M1" control. For HPV pumps with "M1" Control, refer to pages 9-10 for the hydraulic neutral adjustment instructions.

Tools / Equipment Required

- Two (2) 0-600 psi pressure gauges or transducers
- 16mm wrench (optional: adjustable wrench)
- Digital calipers (optional: depth micrometers)
- Hammer and punch



M2P Control

Adjustment Procedure:

1. Install the 0-600 psi pressure gauges into gauge ports "Mp" and "Ms" to measure work-port pressures "P" and "S".
2. Set the input speed to high idle.
3. With the pump in neutral, measure the pressure difference between work-ports "P" and "S".

Note: Pump in neutral means no control pressure or current supplied to the controls. For M2P controls, the lever must be in neutral position.

a. If the maximum pressure difference is 29 psi (2 bar) or less, then adjustment to the hydraulic neutral is NOT required, Remove all gauges from the pump.

b. If the maximum pressure difference is greater than 29 psi (2 bar), then go to step #4.

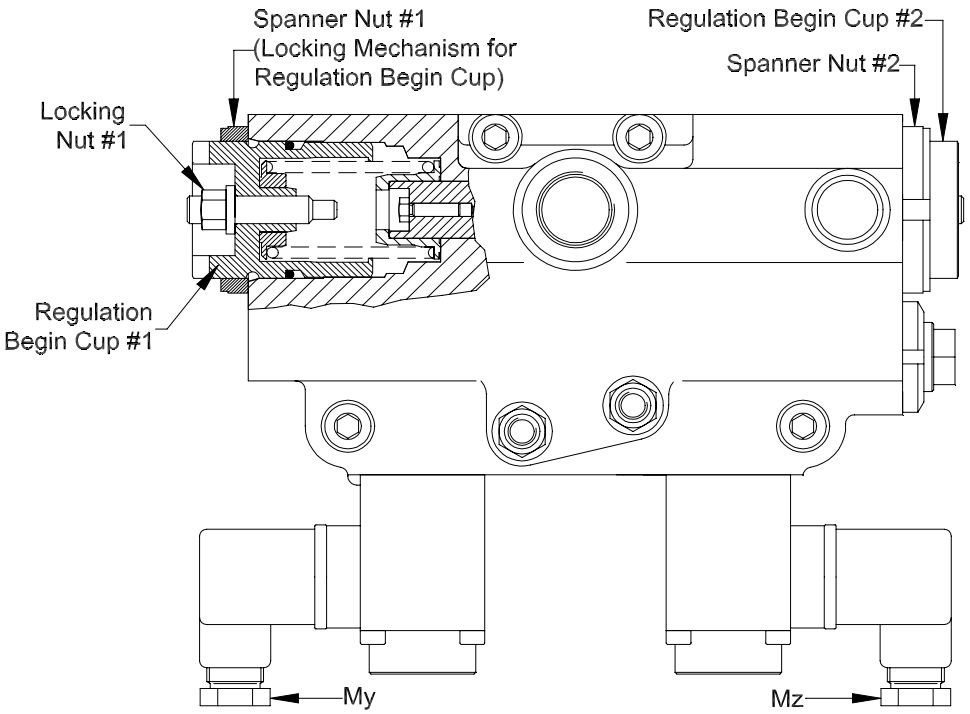
4. Loosen the Spanner Nut with the hammer and punch.
5. Using a 16mm wrench and the digital calipers, adjust the Hydraulic Neutral Adjustment to 14.75mm as illustrated in the sketch above.
6. Repeat steps #2 and #3. Continue to make small adjustments to the Hydraulic Neutral Adjustment until the pressure difference between work-ports "P" and "S" is less than 29 psi.
7. Secure the Hydraulic Neutral Adjustment by tightening the Spanner Nut once all settings are final. Remove all gauges from the pump.

Regulation Begin Adjustment for HPV With Electro-Hydraulic Remote Control

Set Up

Tools / Equipment Required

- Multi-meter (capable of reading 0 to 1000 mA)
- 0-6000 psi pressure gauge or transducer
- 13mm offset closed-end wrench
- Hammer and punch

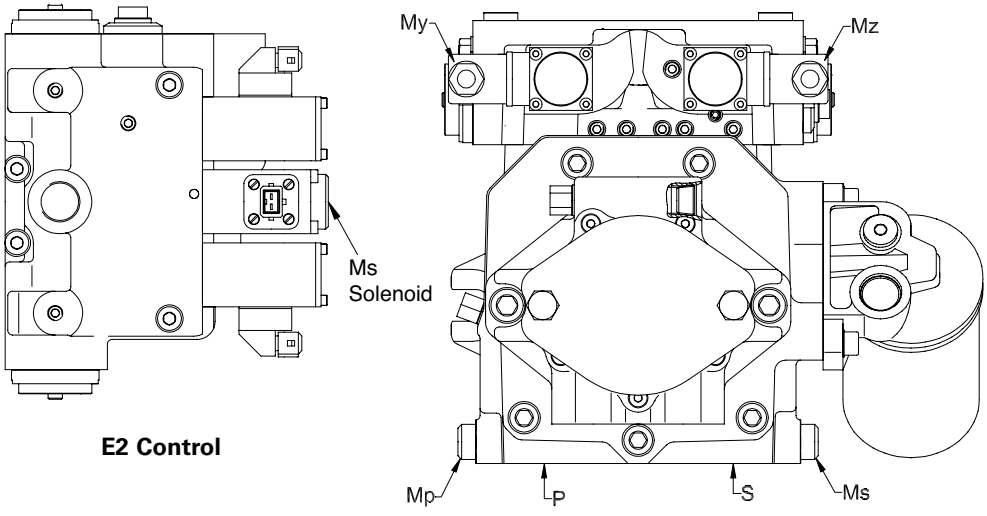


⚠ Important

AFTER adjusting the regulation begin, you must reset the pump maximum displacement setting. Follow the instructions on pages 7-8 to reset the pump maximum displacement.

⚠ WARNING

If performing this procedure on a vehicle, care must be taken. The pump will be put on stroke during this procedure, hence the vehicle must be safely elevated to allow the motor to free-wheel. If this is NOT possible, then the pump workports "P" and "S" must be short circuited to each other to avoid movement of the motor.



E2 Control

Regulation Begin Adjustment for HPV With Electro-Hydraulic Remote Control

Procedure for Right-Hand Rotation

⚠ **Note**

Prior to performing this procedure, verify that the hydraulic neutral on the pump is correctly adjusted.

Adjustment Procedure for Right-Hand Rotation (CW) Pump:

1. Connect the multi-meter to measure current at solenoid "My".
2. Install the 0-6000 psi gauge into gauge port "Mp".
3. Set the pump input speed to high idle.
4. For E2 controls, make sure that Ms Solenoid is energized.
   a. 1.82A (12VDC)
   b. 1.10A (24VDC)
5. While simultaneously monitoring the gauge and multi-meter, slowly energize solenoid "My". Note the current on the multi-meter when you first see pressure increase at port "Mp". This is the regulation begin setting for workport "P".
6. To Adjust the Regulation Begin Setting:
   a. Use the hammer and punch to loosen "Spanner Nut #2".
   b. Use the 13mm wrench on "Locking Nut #2" to adjust "Regulation Begin Cup #2". Turn it IN to increase the regulation begin setting or turn it OUT to decrease it.
   c. Use the hammer and punch to tighten "Spanner Nut #2".
   d. Repeat steps #3 through #5 to verify that the regulation begin setting is:

Control Range:	A (2-8bar)	B (4-10bar)	C(4-16bar)
Regulation Begin for 12 VDC:	350 mA	450 mA	450 mA
Regulation Begin for 24 VDC:	175 mA	225 mA	225 mA

7. Repeat steps #1 through #6 for solenoid "Mz" and gauge port "Ms" to adjust the regulation begin setting for workport "S".

Note: Adjustments should be made to "Regulation Begin Cup #1"

Regulation Begin Adjustment for HPV With Electro-Hydraulic Remote Control

Procedure for Left-Hand Rotation

⚠ **Note**

Prior to performing this procedure, verify that the hydraulic neutral on the pump is correctly adjusted.

Adjustment Procedure for Left-Hand Rotation (CCW) Pump:

1. Connect the multi-meter to measure current at solenoid "Mz".
2. Install the 0-6000 psi gauge into gauge port "Mp".
3. Set the pump input speed to high idle.
4. For E2 controls, make sure that Ms Solenoid is energized.
   a. 1.82A (12VDC)
   b. 1.10A (24VDC)
5. While simultaneously monitoring the gauge and multi-meter, slowly energize solenoid "Mz". Note the current on the multi-meter when you first see pressure increase at port "Mp". This is the regulation begin setting for workport "P".
6. To Adjust the Regulation Begin Setting:
   a. Use the hammer and punch to loosen "Spanner Nut #1".
   b. Use the 13mm wrench on "Locking Nut #1" to adjust "Regulation Begin Cup #1". Turn it IN to increase the regulation begin setting or turn it OUT to decrease it.
   c. Use the hammer and punch to tighten "Spanner Nut #1".
   d. Repeat steps #3 through #5 to verify that the regulation begin setting is:

Control Range:	A (2-8bar)	B (4-10bar)	C(4-16bar)
Regulation Begin for 12 VDC:	350 mA	450 mA	450 mA
Regulation Begin for 24 VDC:	175 mA	225 mA	225 mA

7. Repeat steps #1 through #6 for solenoid "My" and gauge port "Ms" to adjust the regulation begin setting for workport "S".

Note: Adjustments should be made to "Regulation Begin Cup #2".

Maximum Flow Adjustment Procedure for HPV Pumps with “H” or “E” Controls

Set Up

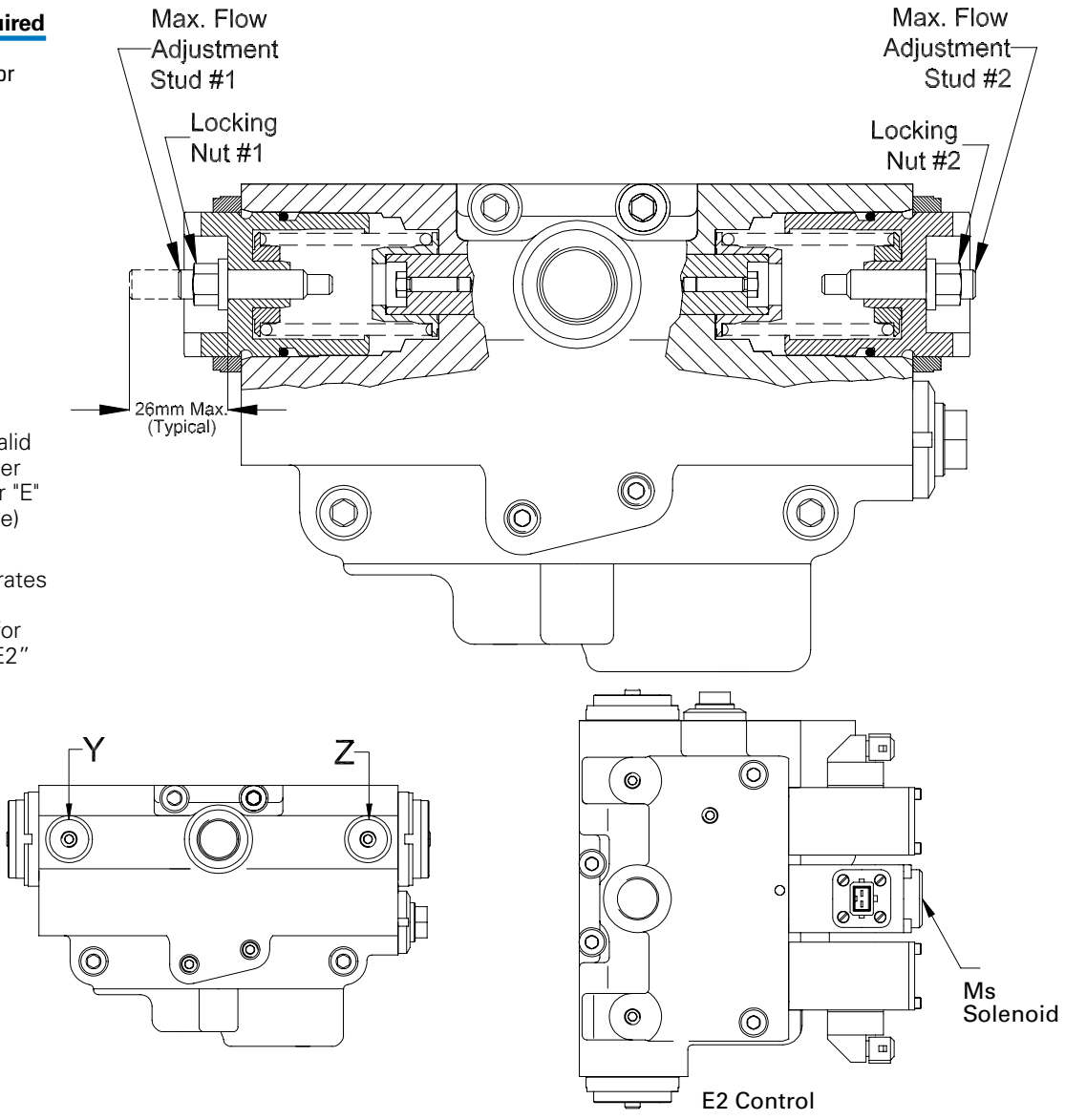
Tools / Equipment Required

- 0-600 psi pressure gauge or transducer (optional)
- 13mm offset closed-end wrench
- 4mm Allen wrench

⚠ **Note**

This Service Bulletin is valid for HPV pumps with either "H" (Hydraulic Remote) or "E" (Electro-Hydraulic Remote) Controls

The drawing below illustrates an "H1" Control, but the information is also valid for “H1P”, “E1”. “E1P, and “E2” Controls.



Maximum Flow Adjustment Procedure for HPV Pumps with "H" or "E" Controls

Adjustment Procedure

⚠ WARNING

If performing this procedure on a vehicle, care must be taken. The pump will be put on stroke during this procedure; hence the vehicle must be safely elevated to allow the motor to free-wheel. If this is NOT possible, then the pump work-ports "P" and "S" must be short circuited to each other. Install a properly sized flow-meter in the short circuit line between "P" and "S" to avoid movement of the motor.

1. (Optional) Install the 0-600 psi gauge into gauge port "Y".
2. Set the input speed to high idle.
3. For E2 Controls, make sure that Ms Solenoid is energized.
   a. 1.82A (12VDC)
   b. 1.10A (24VDC)
4. Supply full control pressure to port "Y" or full current to solenoid "My". (Optional) Confirm that the pressure at port "Y" is adequate to put the pump at full displacement.
5. Measure the rotational speed of the motor, the wheel, the gearbox, etc. and calculate if the pump is supplying enough flow. If using a short circuit line, measure the flow from the flow-meter.
6. To Adjust the Maximum Flow:
   a. Use the 13mm wrench to loosen "Locking Nut #2".
   b. Use the 4mm Allen wrench to turn "Max. Flow Adjustment Stud #2". Turn it IN to decrease the maximum flow or turn it OUT to increase it..

      ⚠ WARNING

      The flow adjustment stud is NOT mechanically restricted from being removed completely from the pump. Care should be taken when turning the flow adjustment stud OUT. DO NOT turn the adjustment stud OUT more than 26mm as illustrated on previous page.

   c. Once the desired maximum flow has been acquired, hold the flow adjustment stud stationary with the 4mm Allen wrench and tighten the locking nut with the 13mm wrench (the proper torque for the locking nut is 10 ft-lb [14 N-m].

7. (Optional) Install the 0-600 psi gauge into gauge port "Z".
8. Set the input speed to high idle.
9. For E2 Controls, Make sure that Ms Solenoid is energized.
   a. 1.82A (12VDC)
   b. 1.10A (24VDC)
10. Supply full control pressure to port "Z" or full current to solenoid "Mz". (Optional) Confirm that the pressure at port "Z" is adequate to put the pump at full displacement.
11. Measure the rotational speed of the motor, the wheel, the gearbox, etc. and calculate if the pump is supplying enough flow. If using the short circuit line, measure the flow from the flow-meter.
12. To Adjust the Maximum Flow:
    a. Use the 13mm wrench to loosen "Locking Nut #1".
    b. Use the 4mm Allen wrench to turn "Max. Flow Adjustment Stud #1". Turn it IN to decrease the maximum flow or turn it OUT to increase it.

⚠ WARNING

The flow adjustment stud is NOT mechanically restricted from being removed completely from the pump. Care should be taken when turning the flow adjustment stud OUT. DO NOT turn the adjustment stud OUT more than 26mm as illustrated on previous page.

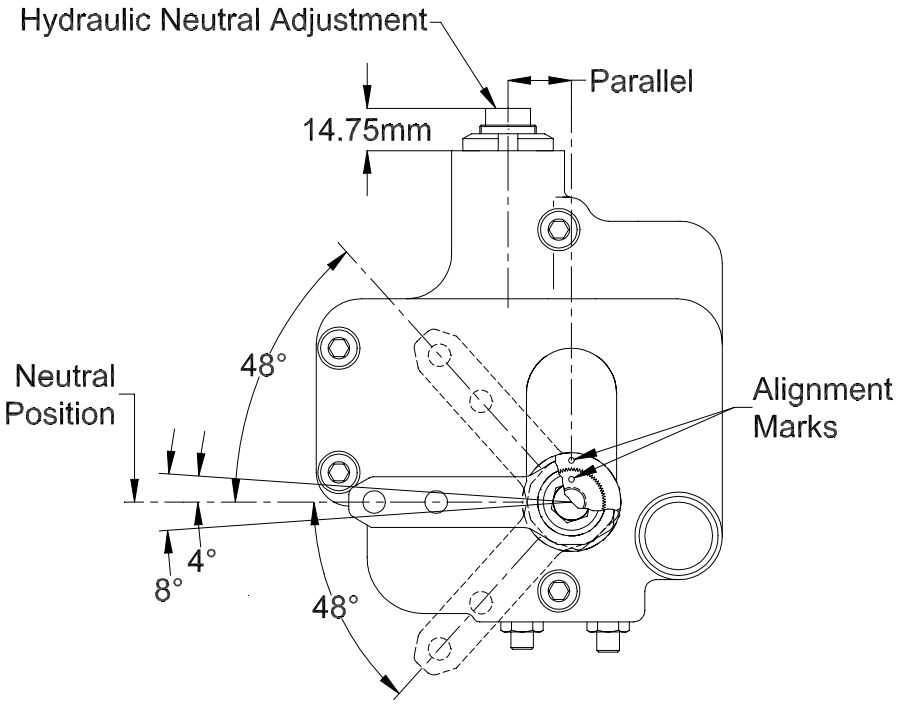
13. Once the desired maximum flow has been acquired, hold the flow adjustment stud stationary with the 4mm Allen wrench and tighten the locking nut with the 13mm wrench (the proper torque for the locking nut is 10 ft-lb [14 N-m]).

HPV Hydraulic Neutral Adjustment Procedure for M1 (Cam) Control

Set Up

Tools / Equipment Required

- Two (2) high pressure gauges or transducers (6000 psi)
- 16mm wrench (optional: adjustable wrench)
- Special pointing device provided by Eaton
- Digital calipers (optional: depth micrometers)
- Hammer and punch



⚠ WARNING

If performing this procedure on a vehicle, care must be taken. The pump will be put on stroke during this procedure; hence the vehicle must be safely elevated to allow the motor to free-wheel. If this is NOT possible, then clear all personnel from the machine to avoid injury when the machine moves.

Note:

The maximum displacement on this control must be set prior to using this Service Bulletin. Please follow all steps on page 38 before continuing with this Service Bulletin.

Note:

The following steps are ONLY to be carried out by those individuals trained on this particular procedure.

HPV Hydraulic Neutral Adjustment Procedure for M1 (Cam) Control

Procedure

Adjustment Procedure:

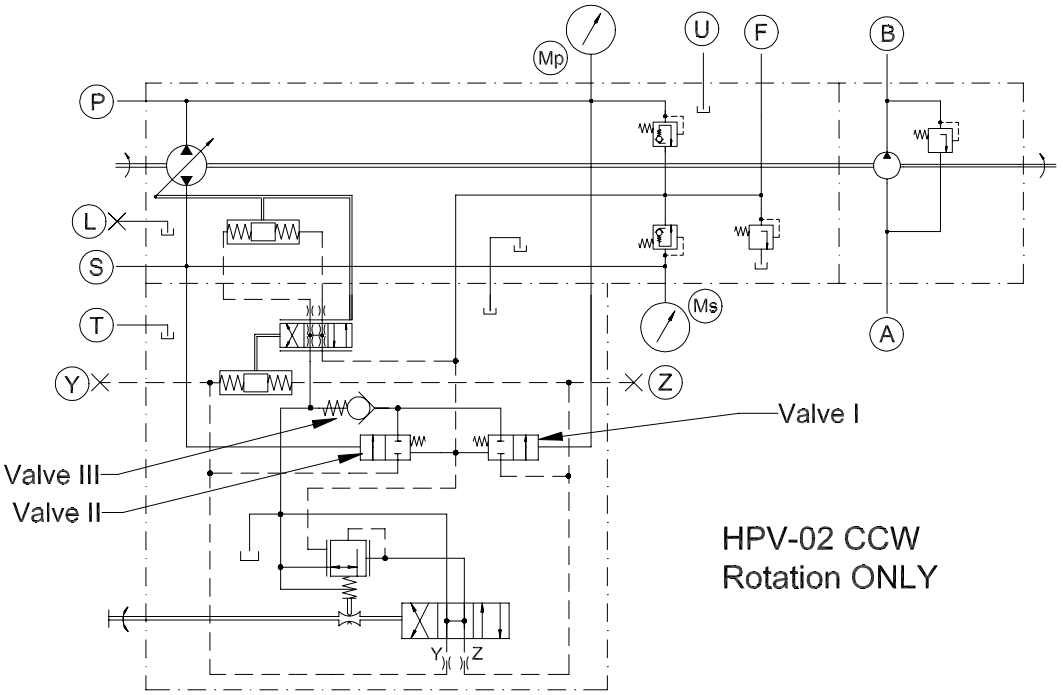
1. Install the two high pressure gauges to measure work-port pressure "P" and "S".
2. Orient the alignment marks so that they are parallel with the centerline of the hydraulic neutral adjustment as illustrated above.
3. Set the input speed to high idle.
4. Measure the pressure difference between work-ports "P" and "S".
   - If the maximum pressure difference is 29 psi (2 bar) or less, then adjustment to the hydraulic neutral is NOT required - Remove all gauges from the pump.
   - If the maximum pressure difference is greater than 29 psi (2 bar), then go to step #5.
5. Loosen the spanner nut on the Hydraulic Neutral Adjustment with the hammer and punch.
6. Using a 16mm wrench and the digital calipers, adjust the hydraulic neutral adjustment to 14.75mm as illustrated in the sketch above.
7. Install the special pointing device onto the cam lever.
8. With the pump aligned in neutral (as described in step #2), make a small mark on the pump control (either with a pen or a magic-marker) where the pointer of the pointing device is pointing.
9. Move the control lever in one direction until the pressure difference between the work-ports "P" and "S" is 580 psi (40 bar). Make a small mark where the pointer is.
10. Move the control lever in the opposite direction until the pressure difference is 580 psi (40 bar). Make a small mark where the pointer is.
11. The initial mark made in step #8 should be directly in the middle of the other two marks made in steps #9 and #10. If not, make a very small adjustment to the hydraulic neutral adjustment. Erase all previous marks and repeat steps #8 through #11 until the initial mark is directly in the middle of the other two marks.
12. Repeat steps #1 through #4 and verify that the maximum pressure difference between work-ports "P" and "S" is 29 psi (2 bar) or less. If not, confirm gauges (or transducers) are calibrated and functioning correctly. You may need to repeat the entire procedure to insure the hydraulic neutral is set correctly.
13. Secure the Hydraulic Neutral Adjustment by tightening the spanner nut. Remove all gauges from the pump.

HPV CCW (Left Hand) Rotation Pumps with “M2P” Control with Pressure Override (POR)

Set Up

⚠ Important

This is a "field adjustment" procedure valid for HPV pumps with CCW (Left-Hand) rotation and M2P control.



Notes:

- Since the oil is being bled over the main relief valves during this procedure, monitor the oil temperature in the main loop to avoid over heating.
- Oil Temperature Limitations for Eaton Components: (-4)°F to 194°F (-20)°C to 90°C
- Changes to any pump setting, control supply pressure, or system hardware after the POR has been adjusted could alter the performance of the POR. It may be necessary to readjust the POR to compensate for any of these changes.
- Recommended Gauges:
  - (Qty 1) 7,500 psi Liquid-filled gauge
    (Qty 2 recommended for ease of testing)
  - (Qty 1) 0-200 psi △p-gauge or △p-transducer

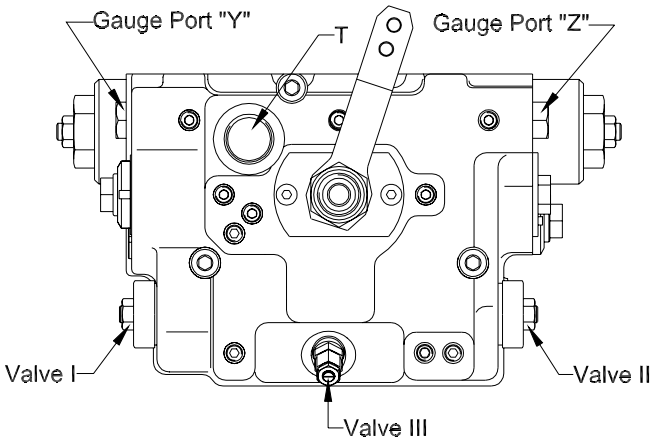
HPV CCW (Left Hand) Rotation Pumps with “M2P” Control with Pressure Override (POR)

Set Up

⚠ Important

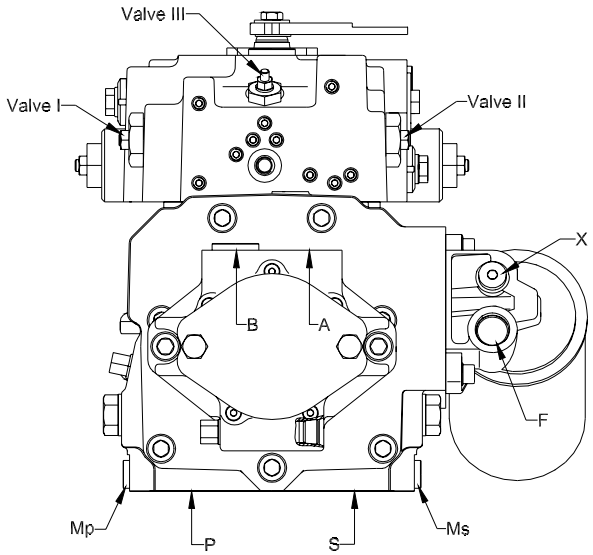
This is a "field adjustment" procedure valid for HPV pumps with CCW (Left-Hand) rotation and M2P control.

Port Identification and Adjustment Locations:



For a CCW Rotation Pump:

	Turn Lever Clockwise	Turn Lever Counter-Clockwise
Control Pressure At Port	Z	Y
Pump Output Pressure at Port	P	S
Must Adjust	Valve I	Valve II



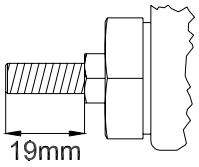
HPV CCW (Left Hand) Rotation Pumps with "M2P" Control with Pressure Override (POR)

Procedure

⚠ Important

This is a "field adjustment" procedure valid for HPV pumps with CCW (Left-Hand) rotation and M2P control.

Pressure Override (POR) Adjustment:



1. POR Setup:

A. Measure and record the regulation begin pressures below.

"△Py-z" Regulation Begin:_____ psi…..(value "a")

"△Pz-y" Regulation Begin:_____ psi…..(value "b")

B. Turn OUT the adjustment screw for "Valve III" all the way (it is mechanically restricted from being removed completely).

C. Turn OUT the adjustment screw for "Valve I" and "Valve II" by 3-4 full turns.

⚠ **WARNING:** Care should be taken NOT to remove the adjustment screw in "Valve I" and "Valve II" completely. Do NOT turn OUT the adjustment screw more than 19mm as illustrated left.

D. Connect the 0-7500 psi liquid-filled gauges to work port gauge ports "Mp" and "Ms".

E. Connect the 0-200 psi △p-gauge/transducer to control gauge ports "Y" and "Z".

"Valve I" and "Valve II" Adjustments:

2. "Valve I" and "Valve II" Adjustments:

A. Close OFF or block both of the pump work ports "P" and "S".

B. Turn the control lever Counter-Clockwise (CCW) fully and hold it.

Note: System pressure will be unstable - This is an expected pump reaction.

C. While monitoring work port pressure "S", SLOWLY turn the adjustment screw for "Valve II" IN until the pressure just stabilizes.

Important: You must slowly turn the adjustment screw in ONLY until the pressure stabilizes and then stop. If you continue to turn the adjustment screw in, system pressure will continue to increase and an unnecessary amount of oil will be forced over the main relief valve, thus the operation of the POR will become less efficient.

D. Tighten the locking nut on "Valve II" and return the control lever to its neutral position.

E. Repeat steps "A" through "D" but turn the control lever Clockwise (CW) fully and monitor work port pressure "P" and adjust "Valve I".

HPV CCW (Left Hand) Rotation Pumps with "M2P" Control with Pressure Override (POR)

Procedure

⚠ Important

This is a "field adjustment" procedure valid for HPV pumps with CCW (Left-Hand) rotation and M2P control.

"Valve III" Adjustment:

3. "Valve III" Adjustment:

A. Keep both of the pump work ports ("P" and "S") closed off or blocked.

B. Turn the control lever Counter-Clockwise (CCW) fully and hold it.

C. Slowly turn IN the adjustment screw for "Valve III" until control pressure "△Py-z" is 10 -15 psi higher than the "△Py-z" Regulation Begin pressure recorded above (value "a").

Record the "△Py-z" setting: _____ psid…….(value "e")

D. Tighten the locking nut on "Valve III" and return the control lever to its neutral position.

E. Turn the control lever Clockwise (CW) fully and hold it. Verify that the pressure is 10 - 15 psi higher than the "Pz-y" Regulation Begin pressure recorded above (value "b").

Record the "△Pz-y" setting: _____ psid…….(value "f")

Hint: If "Valve III" gets too hot, it will be difficult to adjust and/or get consistent results. Allow the pump to cool off if you encounter difficulty adjusting "Valve III".

Final Adjustment:

4. Final Adjustment:

A. IF the difference between (value "e") and (value "f") is 5 psi or less, then NO additional adjustments are required to the POR.

B. IF the difference between (value "e") and (value "f") is greater than 5 psi, then either "Valve I" or "Valve II" needs to be backed out. The side which has the higher value must be backed out until the difference between (value "e") and (value "f") is 5 psi or less.

C. Turn the control lever Counter-Clockwise (CCW) fully and verify that work port pressure "S" is stable and control pressure does NOT increase/decrease for ~10 seconds.

D. Turn the control lever Clockwise (CW) fully and verify that work port pressure "P" is stable and control pressure does NOT increase/decrease for ~10 seconds.

Note: If either one or both work port pressures are not stable, then repeat the POR adjustment process starting with step #1 above.

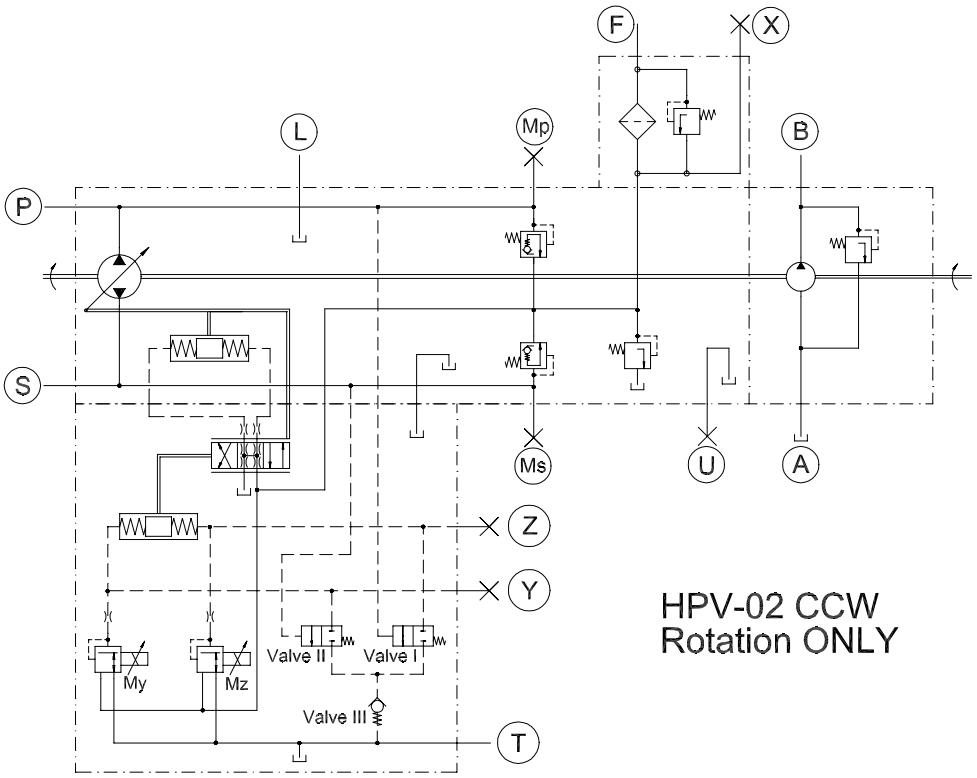
If the control pressure changes during steps "C" or "D" above, then "Valve I" and/or "Valve II" is not adjusted correctly. Repeat the POR adjustment process starting with step #1 above.

HPV CCW (Left-Hand) Rotation Pumps with E1P Control with Pressure Override (POR)

Set Up

⚠ Important

This is a "field adjustment" procedure valid for HPV pumps with CCW (Left-Hand) rotation and E1P Control



Notes:

- Since the oil is being bled over the main relief valves during this procedure, monitor the oil temperature in the main loop to avoid over heating.
- Oil Temperature Limitations for Eaton Components: (-4)°F to 194°F (-20)°C to 90°C
- Changes to any pump setting, control supply pressure, or system hardware after the POR has been adjusted could alter the performance of the POR. It may be necessary to readjust the POR to compensate for any of these changes.
- Recommended Gauges:
  - (Qty 1) 7,500 psi Liquid-filled gauge (Qty 2 recommended for ease of testing)
  - (Qty 1) 0-200 psi △p-gauge or △p-transducer

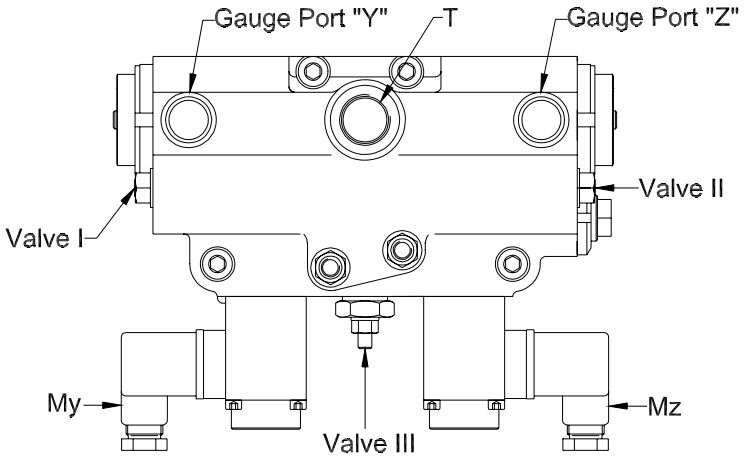
HPV CCW (Left-Hand) Rotation Pumps with E1P Control with Pressure Override (POR)

Set Up

⚠ Important

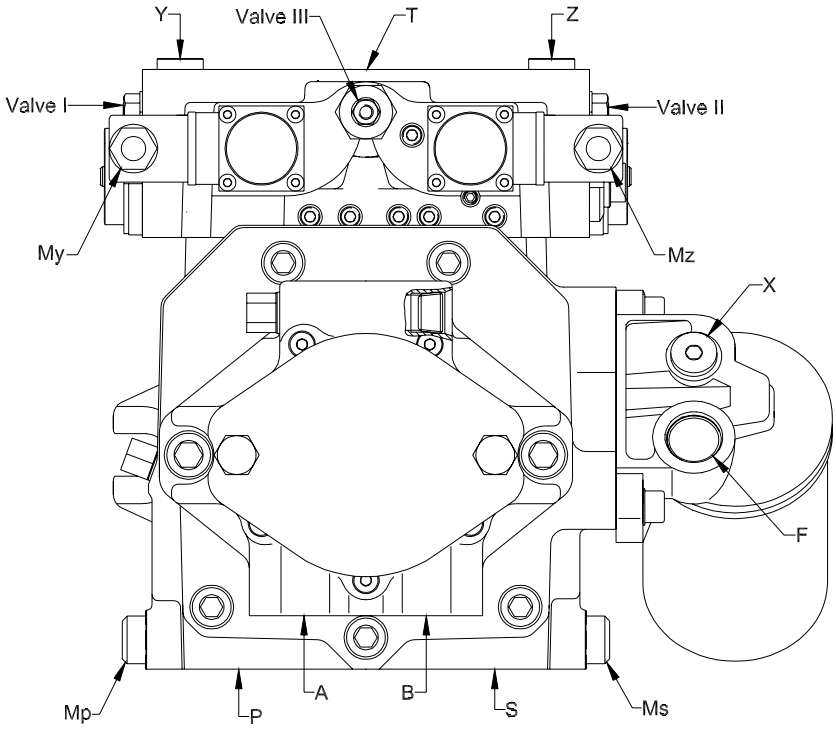
This is a "field adjustment" procedure valid for HPV pumps with CCW (Left-Hand) rotation and E1P Control

Port Identification and Adjustment Locations:



For a CCW Rotation Pump:

	Energize Solenoid My	Energize Solenoid Mz
Control Pressure At Port	Y	Z
Pump Output Pressure at Port	S	P
Must Adjust	Valve II	Valve I



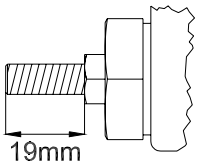
HPV CCW (Left-Hand) Rotation Pumps with E1P Control with Pressure Override (POR)

Procedure

⚠ Important

This is a "field adjustment" procedure valid for HPV pumps with CCW (Left-Hand) rotation and E1P Control

Pressure Override (POR) Adjustment:



1. POR Setup:

A. Measure and record the regulation begin pressures below.

"△Py-z" Regulation Begin:_____ psi…..(value "a")

"△Pz-y" Regulation Begin:_____ psi…..(value "b")

B. Turn OUT the adjustment screw for "Valve III" all the way (it is mechanically restricted from being removed completely).

C. Turn OUT the adjustment screw for "Valve I" and "Valve II" by 3-4 full turns.

⚠ **WARNING:** Care should be taken NOT to remove the adjustment screw in "Valve I" and "Valve II" completely. Do NOT turn OUT the adjustment screw more than 19mm as illustrated left.

D. Connect the 0-7500 psi liquid-filled gauges to work port gauge ports "Mp" and "Ms".

E. Connect the 0-200 psi △p-gauge/transducer to control gauge ports "Y" and "Z".

"Valve I" and "Valve II" Adjustments:

2. "Valve I" and "Valve II" Adjustments:

A. Close OFF or block both of the pump work ports "P" and "S".

B. Energize solenoid "My" to its maximum value and hold it.

Note: System pressure will be unstable - This is an expected pump reaction.

C. While monitoring work port pressure "S", SLOWLY turn the adjustment screw for "Valve II" IN until the pressure just stabilizes.

Important: You must slowly turn the adjustment screw in ONLY until the pressure stabilizes and then stop. If you continue to turn the adjustment screw in, system pressure will continue to increase and an unnecessary amount of oil will be forced over the main relief valve, thus the operation of the POR will become less efficient.

D. Tighten the locking nut on "Valve II" and de-energize solenoid "My".

E. Repeat steps "A" through "D" for solenoid "Mz" while monitoring work port pressure "P" and adjusting "Valve I".

HPV CCW (Left-Hand) Rotation Pumps with E1P Control with Pressure Override (POR)

Procedure

⚠ Important

This is a "field adjustment" procedure valid for HPV pumps with CCW (Left-Hand) rotation and E1P Control

"Valve III" Adjustment:

3. "Valve III" Adjustment:

A. Keep both of the pump work ports ("P" and "S") closed off or blocked.

B. Energize solenoid "My" to its maximum value and hold it.

C. Slowly turn IN the adjustment screw for "Valve III" until control pressure "△Py-z" is 10 -15 psi higher than the "△Py-z" Regulation Begin pressure recorded above (value "a").

Record the "△Py-z" setting: _____ psid…….(value "e")

D. Tighten the locking nut on "Valve III" and de-energize solenoid "My".

E. Energize solenoid "Mz" to its maximum value and hold it. Verify that the pressure is 10 -15 psi higher than the "△Pz-y" Regulation Begin pressure recorded above (value "b").

Record the "△Pz-y" setting: _____ psid…….(value "f")

Hint: If "Valve III" gets too hot, it will be difficult to adjust and/or get consistent results. Allow the pump to cool off if you encounter difficulty adjusting "Valve III".

Final Adjustment:

4. Final Adjustment:

A. IF the difference between (value "e") and (value "f") is 5 psi or less, then NO additional adjustments are required to the POR.

B. IF the difference between (value "e") and (value "f") is greater than 5 psi, then either "Valve I" or "Valve II" needs to be backed out. The side which has the higher value must be backed out until the difference between (value "e") and (value "f") is 5 psi or less.

C. Energize solenoid "My" to its maximum value and verify that work port pressure "S" is stable and control pressure does NOT increase/decrease for ~10 seconds.

D. Energize solenoid "Mz" to its maximum value and verify that work port pressure "P" is stable and control pressure does NOT increase/decrease for ~10 seconds.

Note: If either one or both work port pressures are not stable, then repeat the POR adjustment process starting with step #1 above.

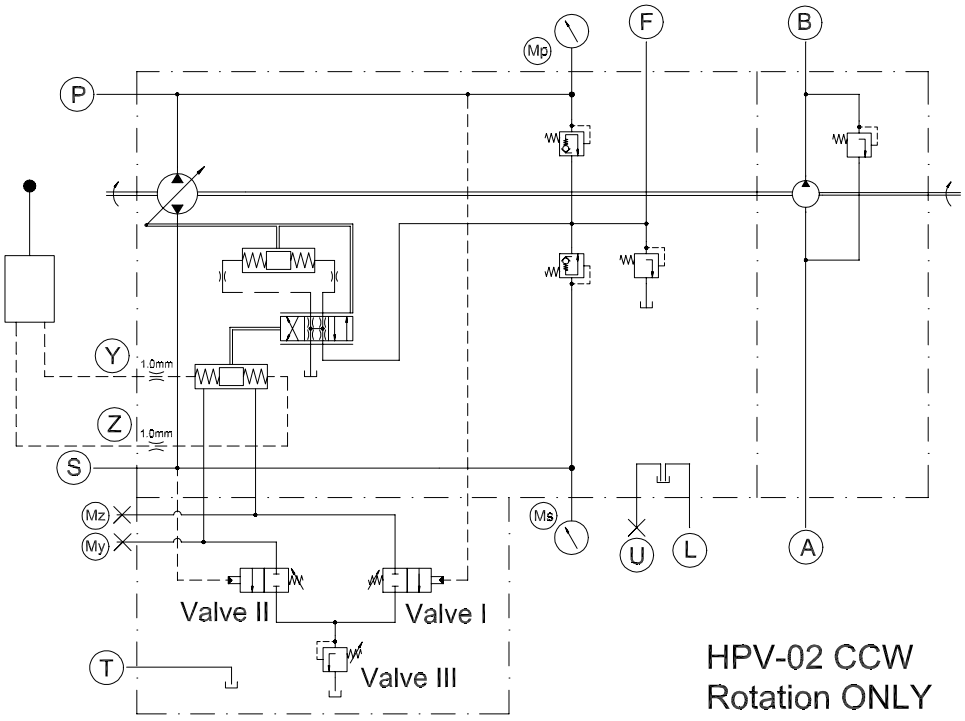
If the control pressure changes during steps "C" or "D" above, then "Valve I" and/or "Valve II" is not adjusted correctly. Repeat the POR adjustment process starting with step #1 above.

HPV CCW (Left Hand) Rotation Pumps with H1P Control with Pressure Override (POR)

Set Up

⚠ Important

This is a "field adjustment" procedure valid for HPV pumps with CCW (Left-Hand) rotation and H1P Control



Notes:

- Since the oil is being bled over the main relief valves during this procedure, monitor the oil temperature in the main loop to avoid over heating.
- Oil Temperature Limitations for Eaton Components: (-4)°F to 194°F (-20)°C to 90°C
- Changes to any pump setting, control supply pressure, or system hardware after the POR has been adjusted could alter the performance of the POR. It may be necessary to readjust the POR to compensate for any of these changes.
- Recommended Gauges:
  - (Qty 1) 7,500 psi Liquid-filled gauge
    (Qty 2 recommended for ease of testing)
  - (Qty 1) 0-200 psi △p-gauge or △p-transducer

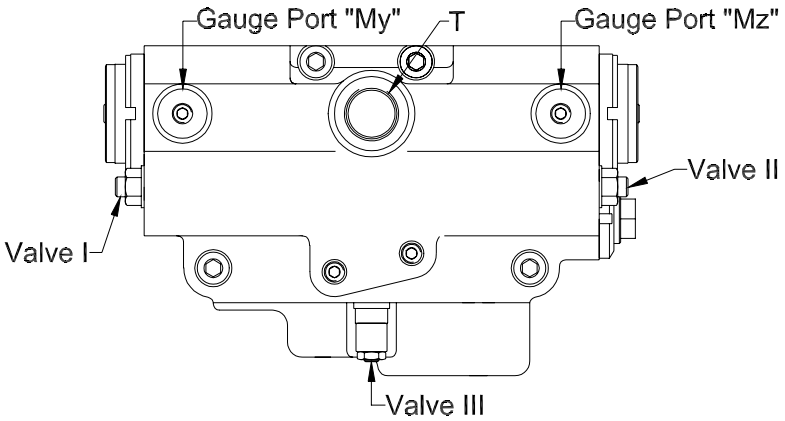
HPV CCW (Left Hand) Rotation Pumps with H1P Control with Pressure Override (POR)

Set Up

⚠ Important

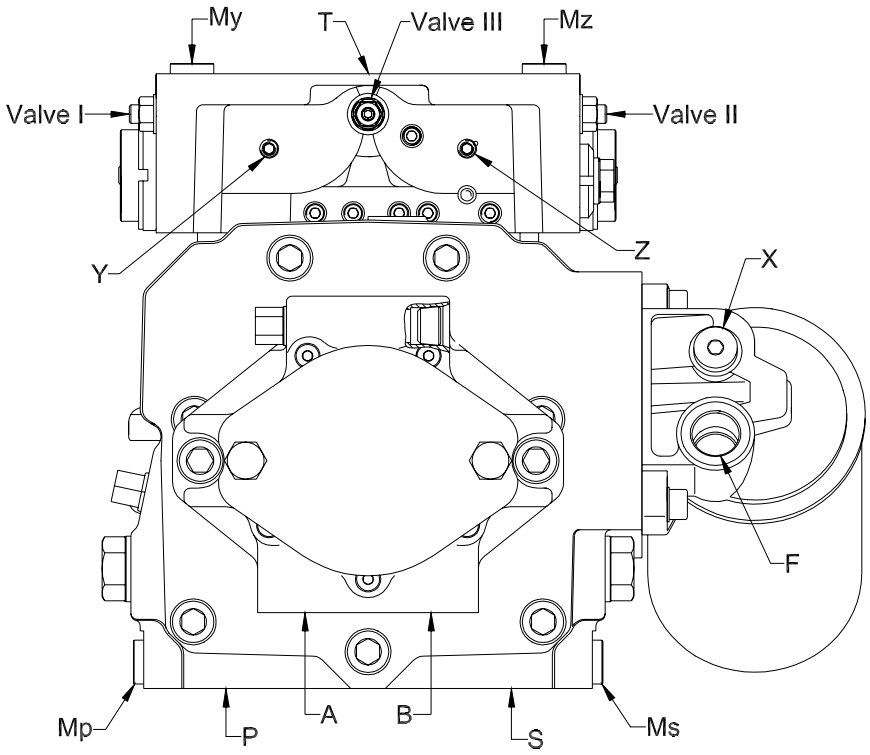
This is a "field adjustment" procedure valid for HPV pumps with CCW (Left-Hand) rotation and H1P Control

Port Identification and Adjustment Locations:



For a CCW Rotation Pump:

	Control Pressure Into Port Y	Control Pressure Into Port Z
Pump Output Pressure At Port	S	P
Must Adjust	Valve II	Valve I



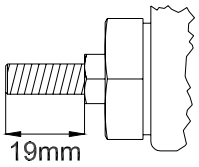
HPV CCW (Left Hand) Rotation Pumps with H1P Control with Pressure Override (POR)

Procedure

⚠ Important

This is a "field adjustment" procedure valid for HPV pumps with CCW (Left-Hand) rotation and H1P Control

Pressure Override (POR) Adjustment:



1. POR Setup:

A. Measure and record the regulation begin pressures below.

"△Py-z" Regulation Begin:_____ psi…..(value "a")

"△Pz-y" Regulation Begin:_____ psi…..(value "b")

B. Turn OUT the adjustment screw for "Valve III" all the way (it is mechanically restricted from being removed completely).

C. Turn OUT the adjustment screw for "Valve I" and "Valve II" by 3-4 full turns.

⚠ **WARNING:** Care should be taken NOT to remove the adjustment screw in "Valve I" and "Valve II" completely. Do NOT turn OUT the adjustment screw more than 19mm as illustrated left.

D. Connect the 0-7500 psi liquid-filled gauges to work port gauge ports "Mp" and "Ms".

E. Connect the 0-200 psi △p-gauge/transducer to control gauge ports"My" and "Mz".

"Valve I" and "Valve II" Adjustments:

2. "Valve I" and "Valve II" Adjustments:

A. Close OFF or block both of the pump work ports "P" and "S".

B. Supply full control pressure into port "Y" and hold it.

Note: System pressure will be unstable - This is an expected pump reaction.

C. While monitoring work port pressure "S", SLOWLY turn the adjustment screw for "Valve II" IN until the pressure just stabilizes.

Important: You must slowly turn the adjustment screw in ONLY until the pressure stabilizes and then stop. If you continue to turn the adjustment screw in, system pressure will continue to increase and an unnecessary amount of oil will be forced over the main relief valve, thus the operation of the POR will become less efficient.

D. Tighten the locking nut on "Valve II" and remove the control pressure from port "Y".

E. Repeat steps "A" through "D" for control port "Z" while monitoring work port pressure "P" and adjusting "Valve I".

HPV CCW (Left Hand) Rotation Pumps with H1P Control with Pressure Override (POR)

Procedure

⚠ Important

This is a "field adjustment" procedure valid for HPV pumps with CCW (Left-Hand) rotation and H1P Control

"Valve III" Adjustment:

3. "Valve III" Adjustment:

A. Keep both of the pump work ports ("P" and "S") closed off or blocked.

B. Supply full control pressure into port "Y" and hold it.

C. Slowly turn IN the adjustment screw for "Valve III" until control pressure "△Py-z" is 10 -15 psi higher than the "△Py-z" Regulation Begin pressure recorded above (value "a").

Record the "△Py-z" setting: _____ psid…….(value "e")

D. Tighten the locking nut on "Valve III" and remove the control pressure from port "Y".

E. Supply full control pressure into port "Z" and hold it. Verify that the pressure is 10 - 15 psi higher than the "△Pz-y" Regulation Begin pressure recorded above (value "b").

Record the "△Pz-y" setting: _____ psid…….(value "f")

Hint: If "Valve III" gets too hot, it will be difficult to adjust and/or get consistent results. Allow the pump to cool off if you encounter difficulty adjusting "Valve III".

Final Adjustment:

4. Final Adjustment:

A. IF the difference between (value "e") and (value "f") is 5 psi or less, then NO additional adjustments are required to the POR.

B. IF the difference between (value "e") and (value "f") is greater than 5 psi, then either "Valve I" or "Valve II" needs to be backed out. The side which has the higher value must be backed out until the difference between (value "e") and (value "f") is 5 psi or less.

C. Supply full control pressure into port "Y" and verify that work port pressure "S" is stable and control pressure does NOT increase/decrease for ~10 seconds.

D. Supply full control pressure into port "Z" and verify that work port pressure "P" is stable and control pressure does NOT increase/decrease for ~10 seconds.

Note: If either one or both work port pressures are not stable, then repeat the POR adjustment process starting with step #1 above.

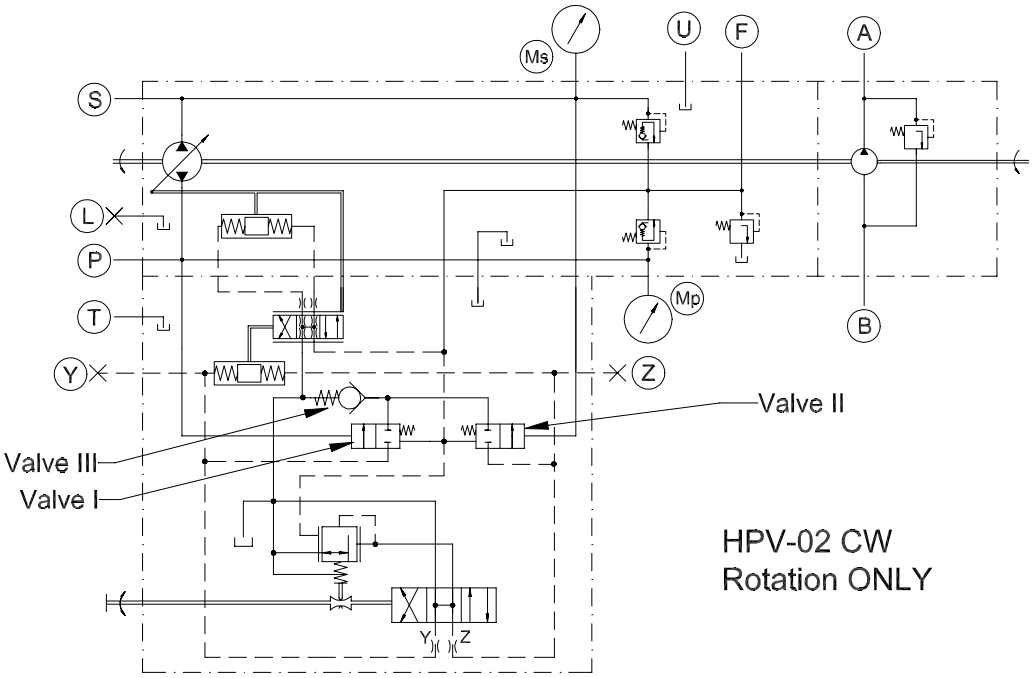
If the control pressure changes during steps "C" or "D" above, then "Valve I" and/or "Valve II" is not adjusted correctly. Repeat the POR adjustment process starting with step #1 above.

HPV CW (Right Hand) Rotation Pumps with “M2P” Control with Pressure Override (POR)

Set Up

⚠ Important

This is a "field adjustment" procedure valid for HPV pumps with CW (Right-Hand) rotation and M2P control



Notes:

- Since the oil is being bled over the main relief valves during this procedure, monitor the oil temperature in the main loop to avoid over heating.
- Oil Temperature Limitations for Eaton Components: (-4)°F to 194°F (-20)°C to 90°C
- Changes to any pump setting, control supply pressure, or system hardware after the POR has been adjusted could alter the performance of the POR. It may be necessary to readjust the POR to compensate for any of these changes.
- Recommended Gauges:
  - (Qty 1) 7,500 psi Liquid-filled gauge (Qty 2 recommended for ease of testing)
  - (Qty 1) 0-200 psi △p-gauge or △p-transducer

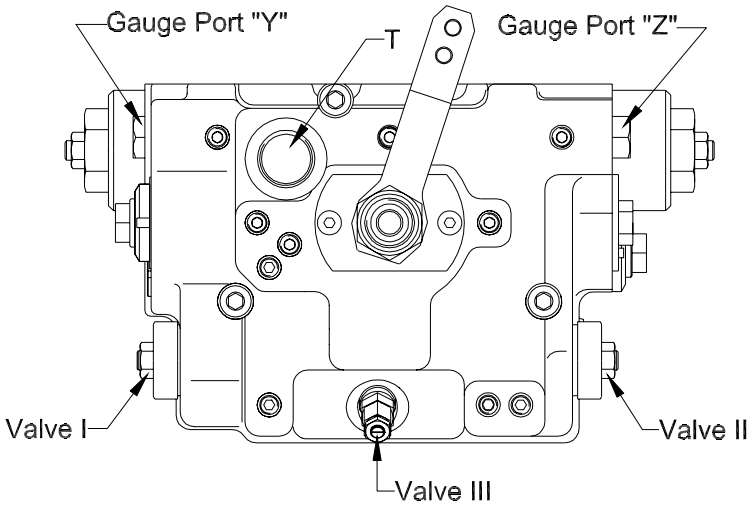
HPV CW (Right Hand) Rotation Pumps with "M2P" Control with Pressure Override (POR)

Set Up

⚠ Important

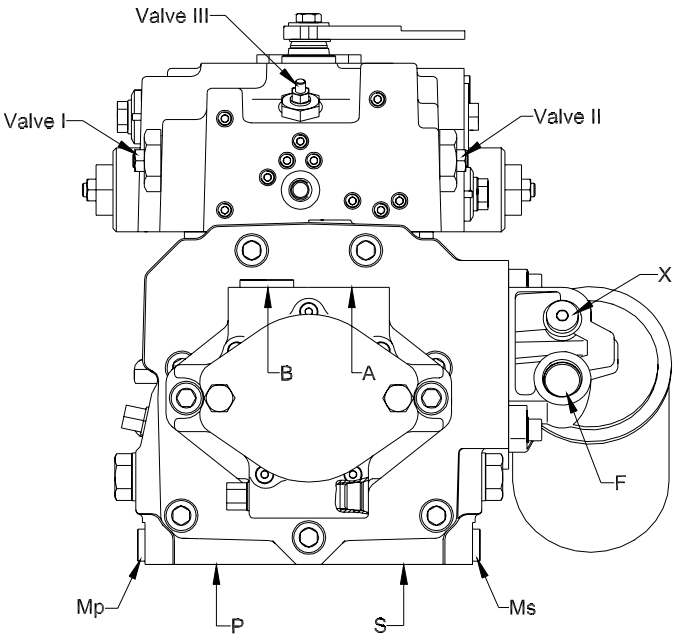
This is a "field adjustment" procedure valid for HPV pumps with CW (Right-Hand) rotation and M2P control

Port Identification and Adjustment Locations:



For a CW Rotation Pump:

	Turn Lever Clockwise	Turn Lever Counter-Clockwise
Control Pressure At Port	Z	Y
Pump Output Pressure at Port	S	P
Must Adjust	Valve II	Valve I



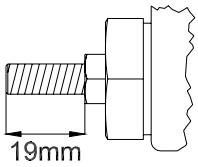
HPV CW (Right Hand) Rotation Pumps with "M2P" Control with Pressure Override (POR)

Procedure

⚠ Important

This is a "field adjustment" procedure valid for HPV pumps with CW (Right-Hand) rotation and M2P control

Pressure Override (POR) Adjustment:



1. POR Setup:

A. Measure and record the regulation begin pressures below.

"△Py-z" Regulation Begin:_____ psi…..(value "a")

"△Pz-y" Regulation Begin:_____ psi…..(value "b")

B. Turn OUT the adjustment screw for "Valve III" all the way (it is mechanically restricted from being removed completely).

C. Turn OUT the adjustment screw for "Valve I" and "Valve II" by 3-4 full turns.

⚠ **WARNING:** Care should be taken NOT to remove the adjustment screw in "Valve I" and "Valve II" completely. Do NOT turn OUT the adjustment screw more than 19mm as illustrated left.

D. Connect the 0-7500 psi liquid-filled gauges to work port gauge ports "Mp" and "Ms".

E. Connect the 0-200 psi △p-gauge/transducer to control gauge ports"Y" and "Z".

"Valve I" and "Valve II" Adjustments:

2. "Valve I" and "Valve II" Adjustments:

A. Close OFF or block both of the pump work ports "P" and "S".

B. Turn the control lever Counter-Clockwise (CCW) fully and hold it.

Note: System pressure will be unstable - This is an expected pump reaction.

C. While monitoring work port pressure "P", SLOWLY turn the adjustment screw for "Valve I" IN until the pressure just stabilizes.

Important: You must slowly turn the adjustment screw in ONLY until the pressure stabilizes and then stop. If you continue to turn the adjustment screw in, system pressure will continue to increase and an unnecessary amount of oil will be forced over the main relief valve, thus the operation of the POR will become less efficient.

D. Tighten the locking nut on "Valve I" and return the control lever to its neutral position.

E. Repeat steps "A" through "D" but turn the control lever Clockwise (CW) fully and monitor work port pressure "S" and adjust "Valve II".

HPV CW (Right Hand) Rotation Pumps with "M2P" Control with Pressure Override (POR)

Procedure

⚠ Important

This is a "field adjustment" procedure valid for HPV pumps with CW (Right-Hand) rotation and M2P control

"Valve III" Adjustment:

3. "Valve III" Adjustment:

A. Keep both of the pump work ports ("P" and "S") closed off or blocked.

B. Turn the control lever Counter-Clockwise (CCW) fully and hold it.

C. Slowly turn IN the adjustment screw for "Valve III" until control pressure "△Py-z" is 10 -15 psi higher than the "△Py-z" Regulation Begin pressure recorded above (value "a").

Record the "△Py-z" setting: _____ psid…….(value "e")

D. Tighten the locking nut on "Valve III" and return the control lever to its neutral position.

E. Turn the control lever Clockwise (CW) fully and hold it. Verify that the pressure is 10 - 15 psi higher than the "△Pz-y" Regulation Begin pressure recorded above (value "b").

Record the "△Pz-y" setting: _____ psid…….(value "f")

Hint: If "Valve III" gets too hot, it will be difficult to adjust and/or get consistent results. Allow the pump to cool off if you encounter difficulty adjusting "Valve III".

Final Adjustment:

4. Final Adjustment:

A. IF the difference between (value "e") and (value "f") is 5 psi or less, then NO additional adjustments are required to the POR.

B. IF the difference between (value "e") and (value "f") is greater than 5 psi, then either "Valve I" or "Valve II" needs to be backed out. The side which has the higher value must be backed out until the difference between (value "e") and (value "f") is 5 psi or less.

C. Turn the control lever Counter-Clockwise (CCW) fully and verify that work port pressure "P" is stable and control pressure does NOT increase/decrease for ~10 seconds.

D. Turn the control lever Clockwise (CW) fully and verify that work port pressure "S" is stable and control pressure does NOT increase/decrease for ~10 seconds.

Note: If either one or both work port pressures are not stable, then repeat the POR adjustment process starting with step #1 above.

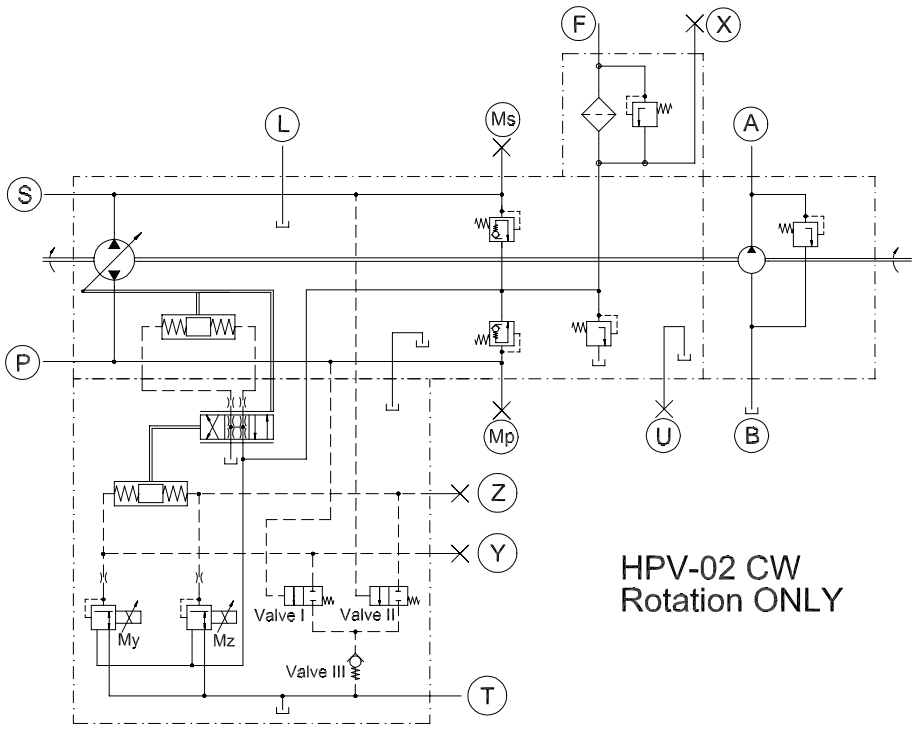
If the control pressure changes during steps "C" or "D" above, then "Valve I" and/or "Valve II" is not adjusted correctly. Repeat the POR adjustment process starting with step #1 above.

HPV CW (Right-Hand) Rotation Pumps with E1P Control with Pressure Override (POR)

Set Up

⚠ Important

This is a "field adjustment" procedure valid for HPV pumps with CW (Right-Hand) rotation and E1P Control



Notes:

- Since the oil is being bled over the main relief valves during this procedure, monitor the oil temperature in the main loop to avoid over heating.
- Oil Temperature Limitations for Eaton Components: (-4)°F to 194°F (-20)°C to 90°C
- Changes to any pump setting, control supply pressure, or system hardware after the POR has been adjusted could alter the performance of the POR. It may be necessary to readjust the POR to compensate for any of these changes.
- Recommended Gauges:
  - (Qty 1) 7,500 psi Liquid-filled gauge (Qty 2 recommended for ease of testing)
  - (Qty 1) 0-200 psi △p-gauge or △p-transducer

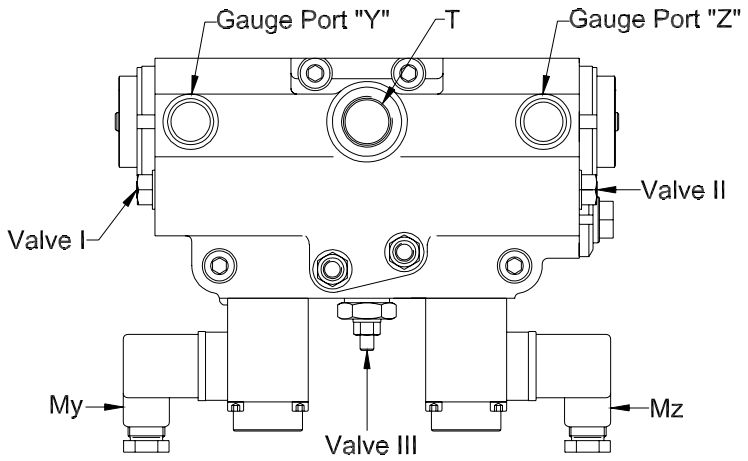
HPV CW (Right-Hand) Rotation Pumps with E1P Control with Pressure Override (POR)

Set Up

⚠ Important

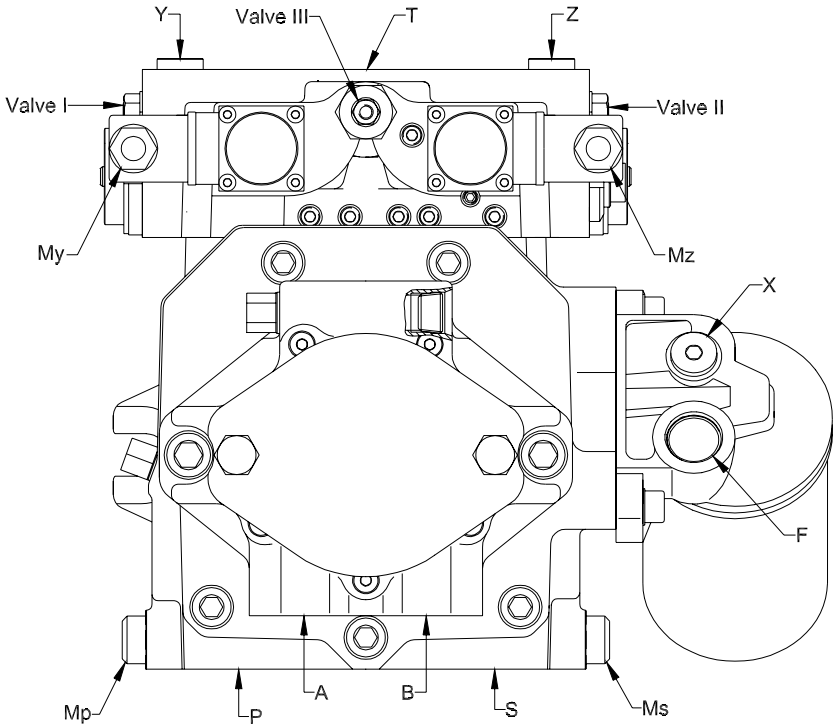
This is a "field adjustment" procedure valid for HPV pumps with CW (Right-Hand) rotation and E1P Control

Port Identification and Adjustment Locations:



For a CW Rotation Pump:

	Energize Solenoid My	Energize Solenoid Mz
Control Pressure At Port	Y	Z
Pump Output Pressure at Port	P	S
Must Adjust	Valve I	Valve II



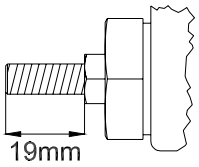
HPV CW (Right-Hand) Rotation Pumps with E1P Control with Pressure Override (POR)

Procedure

⚠ Important

This is a "field adjustment" procedure valid for HPV pumps with CW (Right-Hand) rotation and E1P Control

Pressure Override (POR) Adjustment:



1. POR Setup:

A. Measure and record the regulation begin pressures below.

"△Py-z" Regulation Begin:_____ psi…..(value "a")

"△Pz-y" Regulation Begin:_____ psi…..(value "b")

B. Turn OUT the adjustment screw for "Valve III" all the way (it is mechanically restricted from being removed completely).

C. Turn OUT the adjustment screw for "Valve I" and "Valve II" by 3-4 full turns.

⚠ **WARNING:** Care should be taken NOT to remove the adjustment screw in "Valve I" and "Valve II" completely. Do NOT turn OUT the adjustment screw more than 19mm as illustrated left.

D. Connect the 0-7500 psi liquid-filled gauges to work port gauge ports "Mp" and "Ms".

E. Connect the 0-200 psi △p-gauge/transducer to control gauge ports"Y" and "Z".

"Valve I" and "Valve II" Adjustments:

2. "Valve I" and "Valve II" Adjustments:

A. Close OFF or block both of the pump work ports "P" and "S".

B. Energize solenoid "My" to its maximum value and hold it.

Note: System pressure will be unstable - This is an expected pump reaction.

C. While monitoring work port pressure "P", SLOWLY turn the adjustment screw for "Valve I" IN until the pressure just stabilizes.

Important: You must slowly turn the adjustment screw in ONLY until the pressure stabilizes and then stop. If you continue to turn the adjustment screw in, system pressure will continue to increase and an unnecessary amount of oil will be forced over the main relief valve, thus the operation of the POR will become less efficient.

D. Tighten the locking nut on "Valve I" and de-energize solenoid "My".

E. Repeat steps "A" through "D" for solenoid "Mz" while monitoring work port pressure "S" and adjusting "Valve II".

HPV CW (Right-Hand) Rotation Pumps with E1P Control with Pressure Override (POR)

Procedure

⚠ Important

This is a "field adjustment" procedure valid for HPV pumps with CW (Right-Hand) rotation and E1P Control

"Valve III" Adjustment:

3. "Valve III" Adjustment:

A. Keep both of the pump work ports ("P" and "S") closed off or blocked.

B. Energize solenoid "My" to its maximum value and hold it.

C. Slowly turn IN the adjustment screw for "Valve III" until control pressure "△Py-z" is 10 -15 psi higher than the "△Py-z" Regulation Begin pressure recorded above (value "a").

Record the "△Py-z" setting: _____ psid…….(value "e")

D. Tighten the locking nut on "Valve III" and de-energize solenoid "My".

E. Energize solenoid "Mz" to its maximum value and hold it. Verify that the pressure is 10 - 15 psi higher than the "△Pz-y" Regulation Begin pressure recorded above (value "b").

Record the "△Pz-y" setting: _____ psid…….(value "f")

Hint: If "Valve III" gets too hot, it will be difficult to adjust and/or get consistent results. Allow the pump to cool off if you encounter difficulty adjusting "Valve III".

Final Adjustment:

4. Final Adjustment:

A. IF the difference between (value "e") and (value "f") is 5 psi or less, then NO additional adjustments are required to the POR.

B. IF the difference between (value "e") and (value "f") is greater than 5 psi, then either "Valve I" or "Valve II" needs to be backed out. The side which has the higher value must be backed out until the difference between (value "e") and (value "f") is 5 psi or less.

C. Energize solenoid "My" to its maximum value and verify that work port pressure "P" is stable and control pressure does NOT increase/decrease for ~10 seconds.

D. Energize solenoid "Mz" to its maximum value and verify that work port pressure "S" is stable and control pressure does NOT increase/decrease for ~10 seconds.

Note: If either one or both work port pressures are not stable, then repeat the POR adjustment process starting with step #1 above.

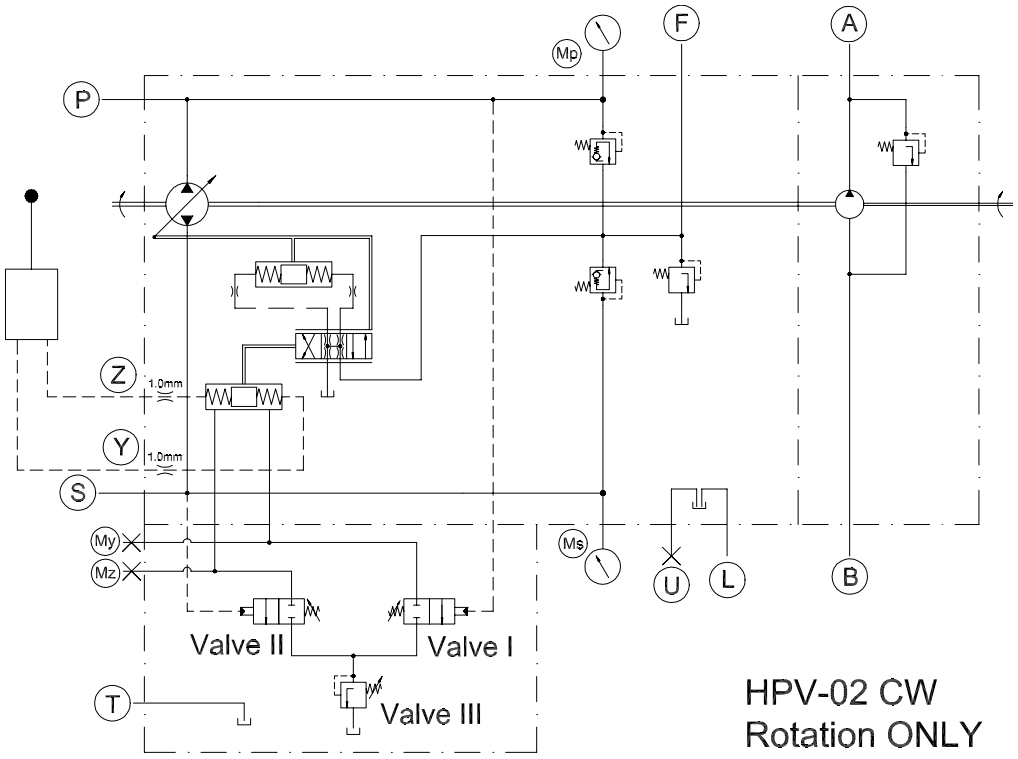
If the control pressure changes during steps "C" or "D" above, then "Valve I" and/or "Valve II" is not adjusted correctly. Repeat the POR adjustment process starting with step #1 above.

HPV CW (Right Hand) Rotation Pumps with H1P Control with Pressure Override (POR)

Set Up

⚠ Important

This is a "field adjustment" procedure valid for HPV pumps with CW (Right-Hand) rotation and H1P Control



Notes:

- Since the oil is being bled over the main relief valves during this procedure, monitor the oil temperature in the main loop to avoid over heating.
- Oil Temperature Limitations for Eaton Components: (-4)°F to 194°F (-20)°C to 90°C
- Changes to any pump setting, control supply pressure, or system hardware after the POR has been adjusted could alter the performance of the POR. It may be necessary to readjust the POR to compensate for any of these changes.
- Recommended Gauges:
  - (Qty 1) 7,500 psi Liquid-filled gauge
    (Qty 2 recommended for ease of testing)
  - (Qty 1) 0-200 psi △p-gauge or △p-transducer

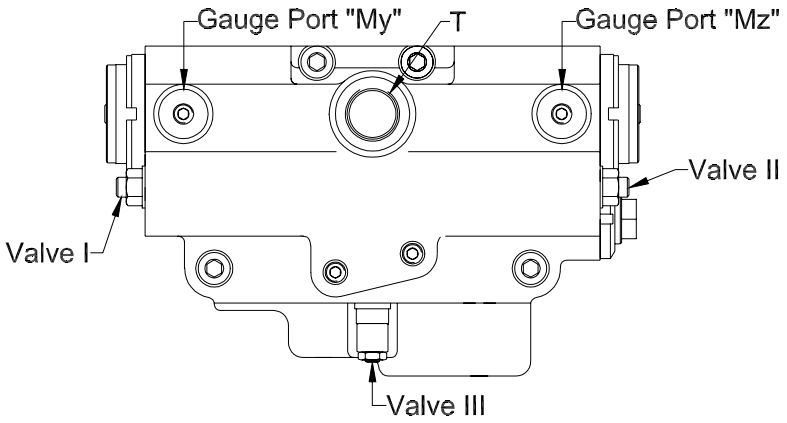
HPV CW (Right Hand) Rotation Pumps with H1P Control with Pressure Override (POR)

Set Up

⚠ Important

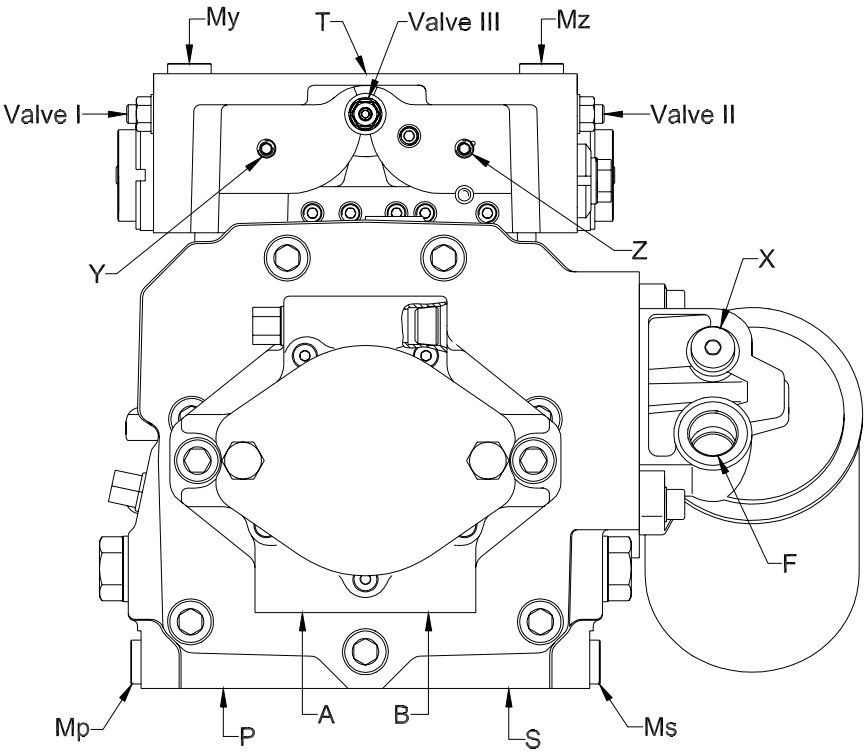
This is a "field adjustment" procedure valid for HPV pumps with CW (Right-Hand) rotation and H1P Control

Port Identification and Adjustment Locations:



For a CW Rotation Pump:

	Control Pressure Into Port Y	Control Pressure Into Port Z
Pump Output Pressure At Port	P	S
Must Adjust	Valve I	Valve II



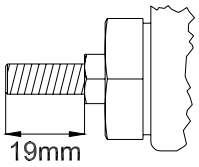
HPV CW (Right Hand) Rotation Pumps with H1P Control with Pressure Override (POR)

Procedure

⚠ Important

This is a "field adjustment" procedure valid for HPV pumps with CW (Right-Hand) rotation and H1P Control

Pressure Override (POR) Adjustment:



1. POR Setup:

A. Measure and record the regulation begin pressures below.

"△Py-z" Regulation Begin:_____ psi…..(value "a")

"△Pz-y" Regulation Begin:_____ psi…..(value "b")

B. Turn OUT the adjustment screw for "Valve III" all the way (it is mechanically restricted from being removed completely).

C. Turn OUT the adjustment screw for "Valve I" and "Valve II" by 3-4 full turns.

⚠ **WARNING:** Care should be taken NOT to remove the adjustment screw in "Valve I" and "Valve II" completely. Do NOT turn OUT the adjustment screw more than 19mm as illustrated left.

D. Connect the 0-7500 psi liquid-filled gauges to work port gauge ports "Mp" and "Ms".

E. Connect the 0-200 psi △p-gauge/transducer to control gauge ports"My" and "Mz".

"Valve I" and "Valve II" Adjustments:

2. "Valve I" and "Valve II" Adjustments:

A. Close OFF or block both of the pump work ports "P" and "S".

B. Supply full control pressure into port "Y" and hold it.

Note: System pressure will be unstable - This is an expected pump reaction.

C. While monitoring work port pressure "P", SLOWLY turn the adjustment screw for "Valve I" IN until the pressure just stabilizes.

Important: You must slowly turn the adjustment screw in ONLY until the pressure stabilizes and then stop. If you continue to turn the adjustment screw in, system pressure will continue to increase and an unnecessary amount of oil will be forced over the main relief valve, thus the operation of the POR will become less efficient.

D. Tighten the locking nut on "Valve I" and remove the control pressure from port "Y".

E. Repeat steps "A" through "D" for control port "Z" while monitoring work port pressure "S" and adjusting "Valve II".

HPV CW (Right Hand) Rotation Pumps with H1P Control with Pressure Override (POR)

Procedure

⚠ Important

This is a "field adjustment" procedure valid for HPV pumps with CW (Right-Hand) rotation and H1P Control

"Valve III" Adjustment:

3. "Valve III" Adjustment:

A. Keep both of the pump work ports ("P" and "S") closed off or blocked.

B. Supply full control pressure into port "Y" and hold it.

C. Slowly turn IN the adjustment screw for "Valve III" until control pressure "△Py-z" is 10 -15 psi higher than the "△Py-z" Regulation Begin pressure recorded above (value "a").

Record the "△Py-z" setting: _____ psid…….(value "e")

D.Tighten the locking nut on "Valve III" and remove the control pressure from port "Y".

E. Supply full control pressure into port "Z" and hold it. Verify that the pressure is 10 - 15 psi higher than the "△Pz-y" Regulation Begin pressure recorded above (value "b").

Record the "△Pz-y" setting: _____ psid…….(value "f")

Hint: If "Valve III" gets too hot, it will be difficult to adjust and/or get consistent results. Allow the pump to cool off if you encounter difficulty adjusting "Valve III".

Final Adjustment:

4. Final Adjustment:

A. IF the difference between (value "e") and (value "f") is 5 psi or less, then NO additional adjustments are required to the POR.

B. IF the difference between (value "e") and (value "f") is greater than 5 psi, then either "Valve I" or "Valve II" needs to be backed out. The side which has the higher value must be backed out until the difference between (value "e") and (value "f") is 5 psi or less.

C. Supply full control pressure into port "Y" and verify that work port pressure "P" is stable and control pressure does NOT increase/decrease for ~10 seconds.

D. Supply full control pressure into port "Z" and verify that work port pressure "S" is stable and control pressure does NOT increase/decrease for ~10 seconds.

Note: If either one or both work port pressures are not stable, then repeat the POR adjustment process starting with step #1 above.

If the control pressure changes during steps "C" or "D" above, then "Valve I" and/or "Valve II" is not adjusted correctly. Repeat the POR adjustment process starting with step #1 above.

Maximum Flow Adjustment Procedure for HPV Pumps with "M2P" (Mechanical-Hydraulic with POR) Controls

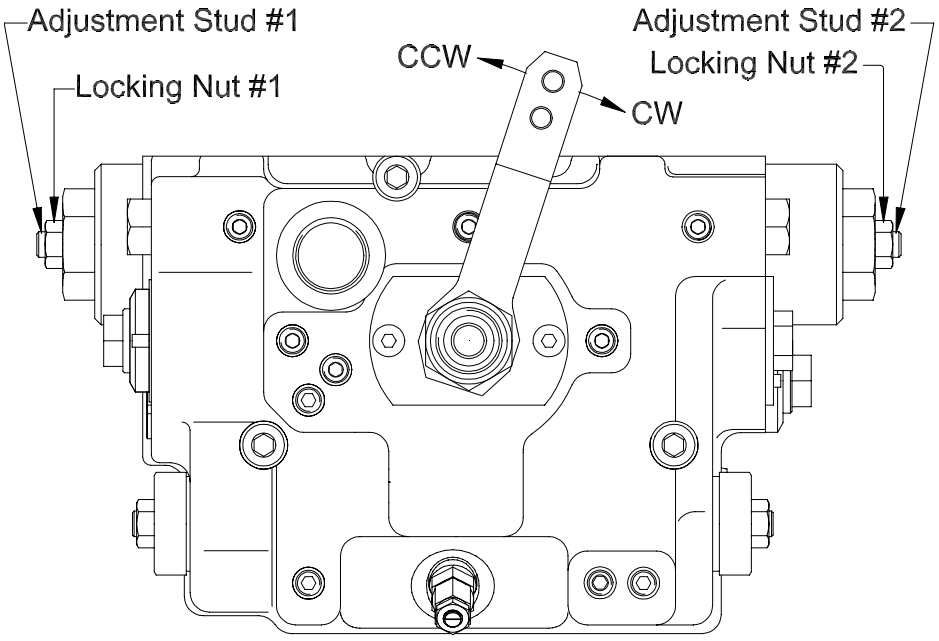
Set Up

⚠ Note

This Service Bulletin is ONLY valid for HPV pumps with the "M2P" (Mechanical-Hydraulic with POR) control.

Tools / Equipment Required

- 17mm wrench
- 5mm Allen wrench



⚠ WARNING

If performing this procedure on a vehicle, care must be taken. The pump will be put on stroke during this procedure; hence the vehicle must be safely elevated to allow the function to free-wheel. If this is NOT possible, then the pump work ports "P" and "S" must be short circuited to each other. Install a properly sized flowmeter in the short circuit line between "P" and "S" to avoid movement of the function.

Maximum Flow Adjustment Procedure for HPV Pumps with "M2P" (Mechanical-Hydraulic with POR) Controls

Procedure

⚠ Note

This Service Bulletin is ONLY valid for HPV pumps with the "M2P" (Mechanical-Hydraulic with POR) control.

Adjustment Procedure

Set the pump input speed to operational speed.

1. Turn the cam lever CCW (as illustrated above) fully.
2. Measure the rotational speed of the motor, the wheel, the gearbox, etc. and calculate if the pump is supplying enough flow. If using a short circuit line, measure the flow from the flowmeter.
3. To adjust the maximum flow:
   a. Use a 17mm wrench to loosen Locking Nut #2.
   b. Use a 5mm Allen wrench to turn Adjustment Stud #2. Turn it IN to decrease the maximum flow or OUT to increase it.

   ⚠ WARNING

   The flow adjustment stud is NOT mechanically restricted from being removed completely from the pump. Care should be taken when turning the flow adjustment stud OUT as to prevent it from being removed from the pump control.

   c. Once the desired maximum flow has been acquired, hold Adjustment Stud #2 stationary with the 5mm Allen wrench and tighten Locking Nut #2 with the 17mm wrench.
4. Turn the cam lever CW (as illustrated on the previous page) fully.
5. Measure the rotational speed of the motor, the wheel, the gearbox, etc. and calculate if the pump is supplying enough flow. If using a short circuit line, measure the flow from the flowmeter.
6. To adjust the maximum flow:
   a. Use a 17mm wrench to loosen Locking Nut #1.
   b. Use a 5mm Allen wrench to turn Adjustment Stud #1. Turn it IN to decrease the maximum flow or OUT to increase it.

   ⚠ WARNING

   The flow adjustment stud is NOT mechanically restricted from being removed completely from the pump. Care should be taken when turning the flow adjustment stud OUT as to prevent it from being removed from the pump control.

   c. Once the desired maximum flow has been acquired, hold Adjustment Stud #1 stationary with the 5mm Allen wrench and tighten Locking Nut #1 with the 17mm wrench.

Adjusting the Deadband on HPV Pumps with "M2P" (Mechanical-Hydraulic with POR) Controls

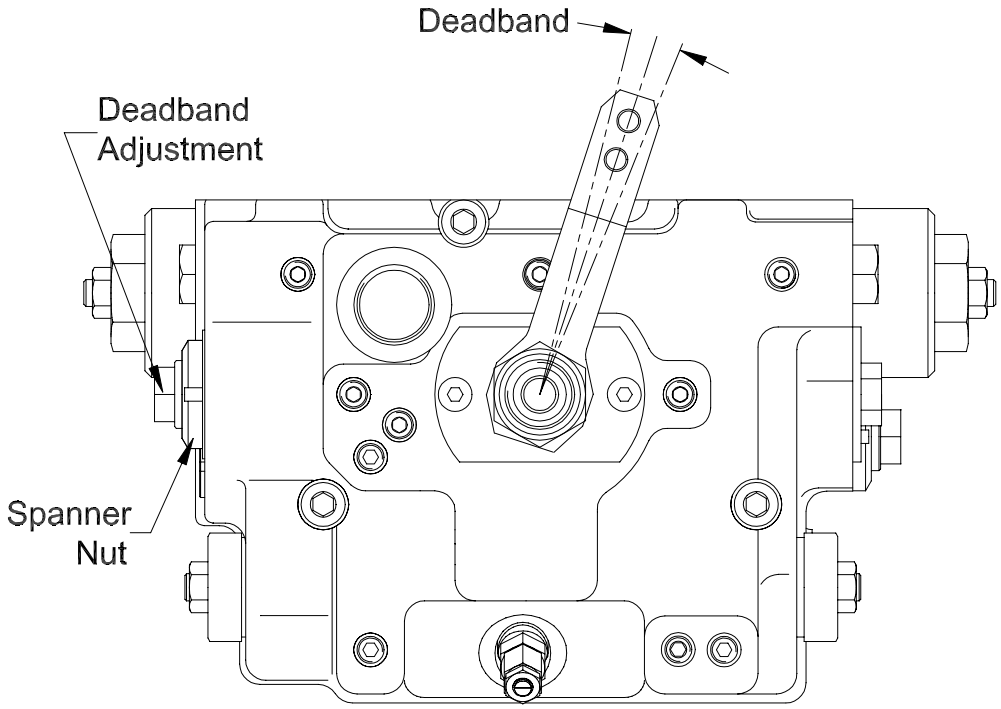
Set Up and Procedure

⚠ Note

This Service Bulletin is ONLY valid for HPV pumps with "M2P" (Mechanical-Hydraulic with POR) controls.

Tools / Equipment Required

- 16mm wrench (optional: adjustable wrench)
- Hammer and punch



Adjustment Procedure

1. With the hammer and punch, loosen the Spanner Nut on the Deadband Adjustment.
2. With the 16mm wrench, either turn the Deadband Adjustment IN or OUT to adjust the cam lever deadband to the desired range.

Hint: Turn the Deadband Adjustment IN to reduce the cam lever deadband range or OUT to increase it.

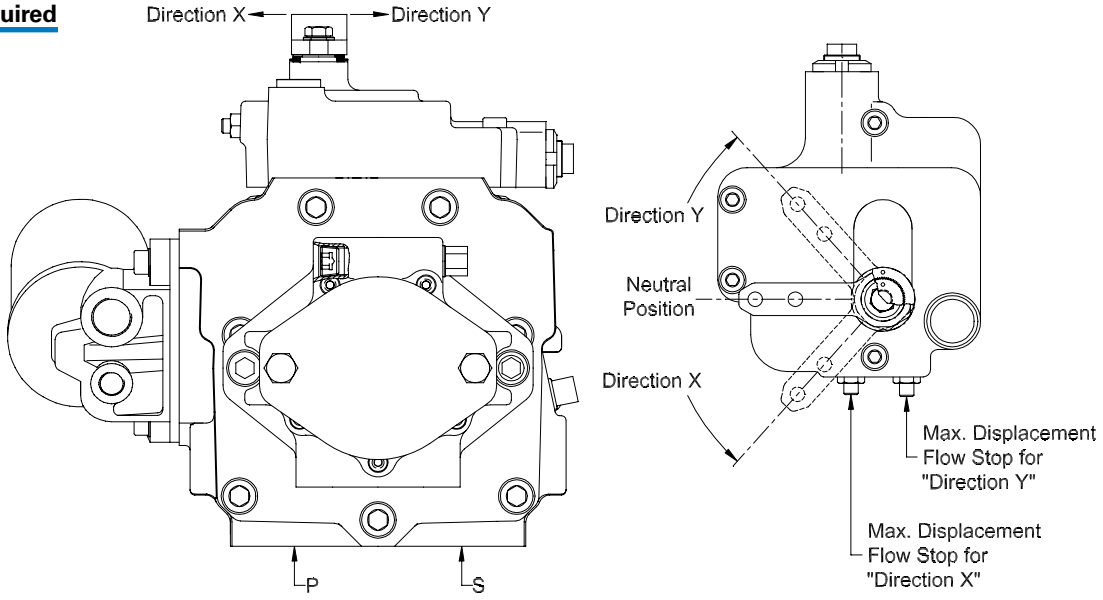
3. Once the desired deadband range is acquired, use the hammer and punch to tighten the Spanner Nut.

HPV Maximum Displacement Adjustment for M1 (Mechanical-Hydraulic) Control

Set Up and Procedure

Tools / Equipment Required

- 13mm open or close end wrench
- 4mm Allen wrench



Flow Orientation:

	Turn Lever In Direction	Pressure From Port
For CW (Right Hand) Rotation	X	P
	Y	S
For CCW (Left Hand) Rotation	X	S
	Y	P

Adjustment Procedure:

1. Loosen the flow-stop lock nut with 13mm wrench.
2. Turn the cam lever in the appropriate direction.
3. Turn the adjustment stud IN to decrease the flow or OUT to increase the flow using the 4mm Allen wrench.

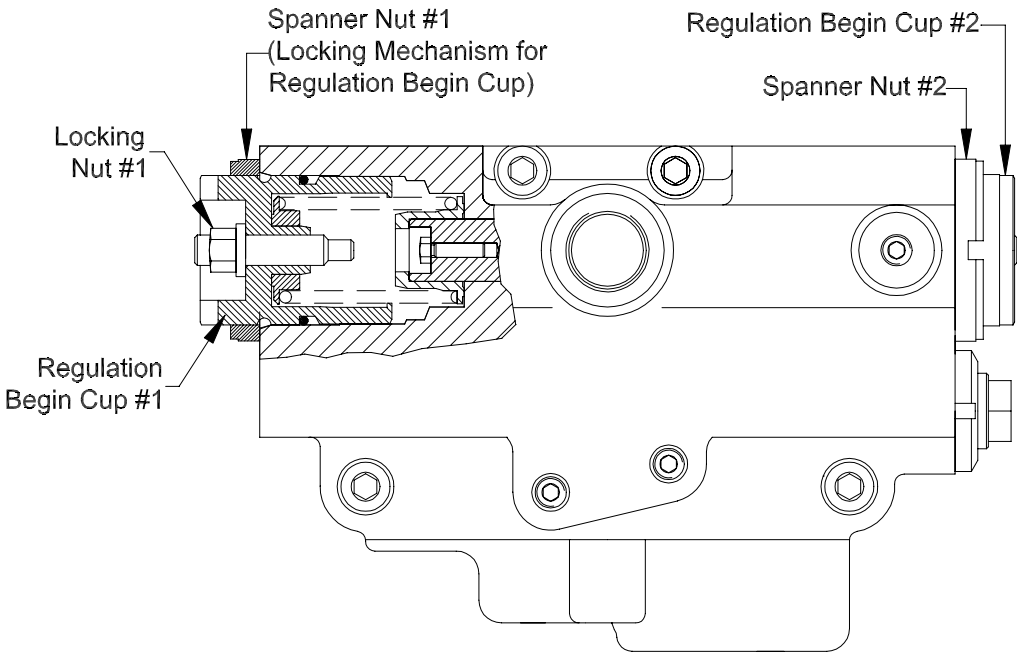
When desired flow is acquired, hold the adjustment stud stationary with the 4mm Allen wrench and tighten the lock nut with the 13mm wrench (the proper torque for the lock nut is 14 N-m [10 ft-lb]).

Regulation Begin Adjustment for HPV Pump with Hydraulic Remote Control

Set Up

Tools / Equipment Required

- 0-600 psi △p-gauge (optional: two(2) 0-600 psi pressure gauges or transducers)
- 0-6000 psi pressure gauge or transducer
- 13mm offset closed-end wrench
- Hammer and punch

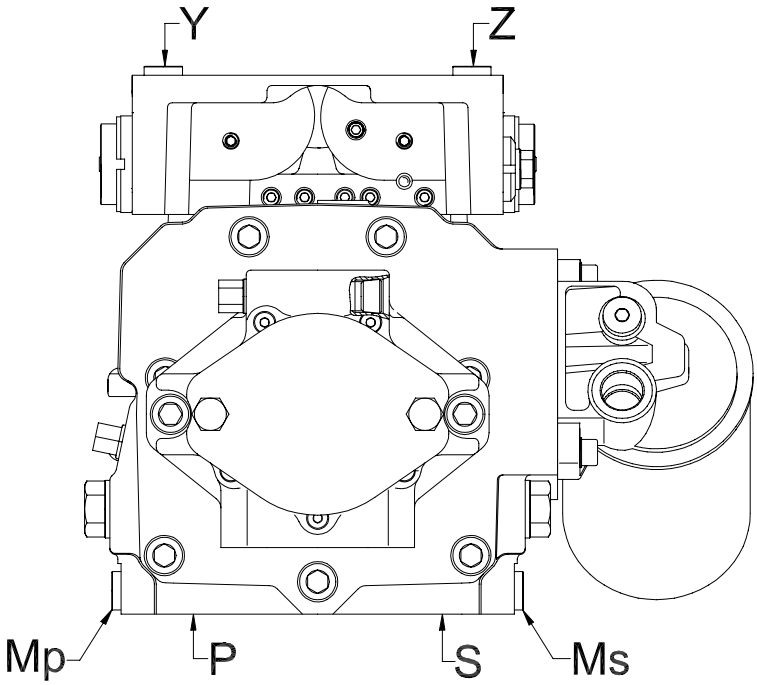


⚠ **Important**

AFTER adjusting the regulation begin, you must reset the pump maximum displacement setting. Follow the instructions on pages 7-8 to reset the pump maximum displacement.

⚠ **WARNING**

If performing this procedure on a vehicle, care must be taken. The pump will be put on stroke during this procedure, hence the vehicle must be safely elevated to allow the function to free-wheel. If this is NOT possible, then the pump workports "P" and "S" must be short circuited to each other to avoid movement of the function.



Regulation Begin Adjustment for HPV Pump with Hydraulic Remote Control

Procedure for Right-Hand (CW) Rotation

⚠ Note

Prior to performing this procedure, verify that the hydraulic neutral on the pump is correctly adjusted. Use the instructions on page 3 to check and adjust the hydraulic neutral setting if required.

Adjustment Procedure for Right-Hand Rotation (CW) Pump:

1. Install the 0-600 psi △p-gauge into ports "Y" and "Z" ("HI" side into "Y" and "LO" side into "Z").
2. Install the 0-6000 psi gauge into gauge port "Mp".
3. Set the input speed to Operational Speed.
4. While simultaneously monitoring both gauges, slowly supply control pressure into port "Y". Note the pressure on the △p-gauge when you first see pressure at port "Mp". This is the regulation begin pressure for workport "P".
5. To Adjust the Regulation Begin Pressure:
   a. Use the hammer and punch to loosen (rotate CCW) "Spanner Nut #2".
   b. Use the 13mm wrench on "Locking Nut #2" to adjust "Regulation Begin Cup #2". Turn it IN to increase the regulation begin pressure or turn it OUT to decrease it.
   c. Use the hammer and punch to tighten (rotate CW) "Spanner Nut #2".
   d. Repeat steps #3 and #4 to verify that the regulation begin pressure is correct.
6. Install the 0-600 psi △p-gauge into ports "Z" and "Y" ("HI" side into "Z" and "LO" side into "Y").
7. Install the 0-6000 psi gauge into gauge port "Ms".
8. Set the input speed to operational speed.
9. While simultaneously monitoring both gauges, slowly supply control pressure into port "Z". Note the pressure on the △p-gauge when you first see pressure at port "Ms". This is the regulation begin pressure for workport "S".
10. To Adjust the Regulation Begin Pressure:
    a. Use the hammer and punch to loosen (rotate CCW) "Spanner Nut #1".
    b. Use the 13mm wrench on "Locking Nut #1" to adjust "Regulation Begin Cup #1". Turn it IN to increase the regulation begin pressure or turn it OUT to decrease it.
    c. Use the hammer and punch to tighten (rotate CW) "Spanner Nut #1".
    d. Repeat steps #8 and #9 to verify that the regulation begin pressure is correct.
11. Follow all steps on pages 7-8 to reset the maximum displacement.

Regulation Begin Adjustment for HPV Pump with Hydraulic Remote Control

Procedure for Left-Hand Rotation (CCW) Pump

⚠ **Note**

Prior to performing this procedure, verify that the hydraulic neutral on the pump is correctly adjusted. Use the instructions on page 3 to check and adjust the hydraulic neutral setting if required.

Adjustment Procedure for Left-Hand Rotation (CCW) Pump:

1. Install the 0-600 psi △p-gauge into ports "Y" and "Z" ("HI" side into "Y" and "LO" side into "Z").
2. Install the 0-6000 psi gauge into gauge port "Ms".
3. Set the input speed to operational speed.
4. While simultaneously monitoring both gauges, slowly supply control pressure into port "Y". Note the pressure on the △p-gauge when you first see pressure at port "Ms". This is the regulation begin pressure for workport "S".
5. To Adjust the Regulation Begin Pressure:
   a. Use the hammer and punch to loosen (rotate CCW) "Spanner Nut #2".
   b. Use the 13mm wrench on "Locking Nut #2" to adjust "Regulation Begin Cup #2". Turn it IN to increase the regulation begin pressure or turn it OUT to decrease it.
   c. Use the hammer and punch to tighten (rotate CW) "Spanner Nut #2".
   d. Repeat steps #3 and #4 to verify that the regulation begin pressure is correct.
6. Install the 0-600 psi △p-gauge into ports "Z" and "Y" ("HI" side into "Z" and "LO" side into "Y").
7. Install the 0-6000 psi gauge into gauge port "Mp".
8. Set the input speed to operational speed.
9. While simultaneously monitoring both gauges, slowly supply control pressure into port "Z". Note the pressure on the △p-gauge when you first see pressure at port "Mp". This is the regulation begin pressure for workport "P".
10. To Adjust the Regulation Begin Pressure:
    a. Use the hammer and punch to loosen (rotate CCW) "Spanner Nut #1".
    b. Use the 13mm wrench on "Locking Nut #1" to adjust "Regulation Begin Cup #1". Turn it IN to increase the regulation begin pressure or turn it OUT to decrease it.
    c. Use the hammer and punch to tighten (rotate CW) "Spanner Nut #1".
    d. Repeat steps #8 and #9 to verify that the regulation begin pressure is correct.
11. Follow all steps on pages 7-8 to reset the maximum displacement.

Regulation Begin Adjustment for HPV Pumps with "M2P" (Mechanical-Hydraulic with POR) Controls

Set Up

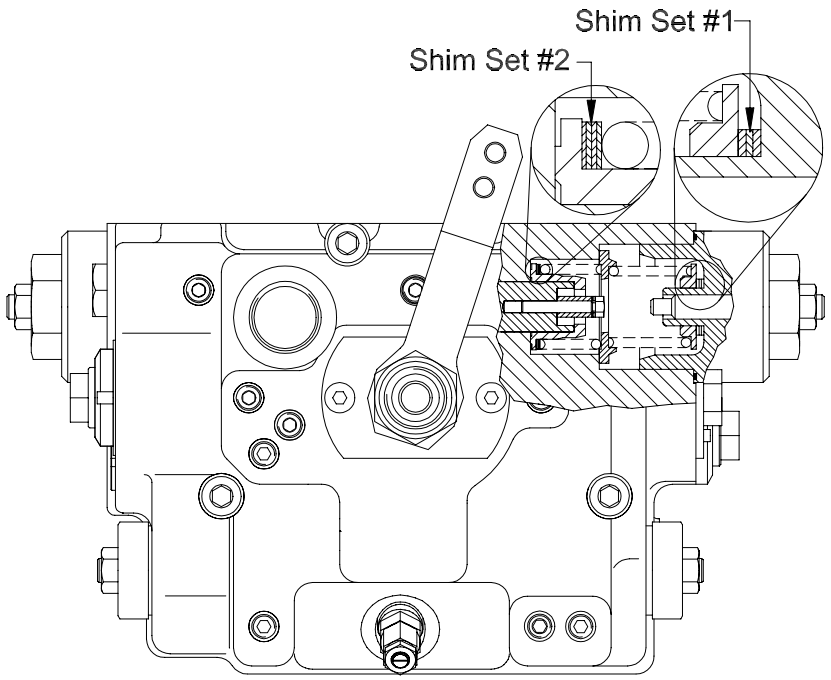
⚠ Note

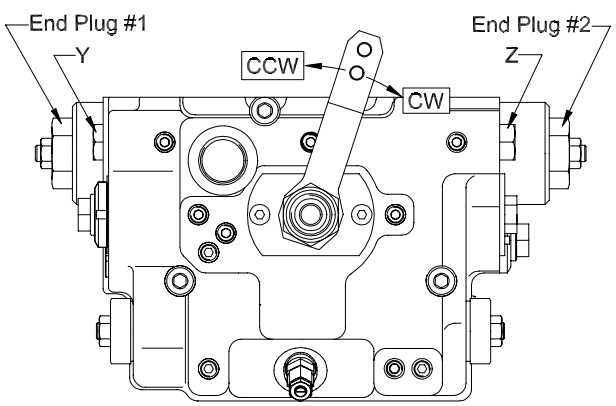
This Service Bulletin is ONLY valid for HPV pumps with "M2P" (Mechanical-Hydraulic with POR) controls.

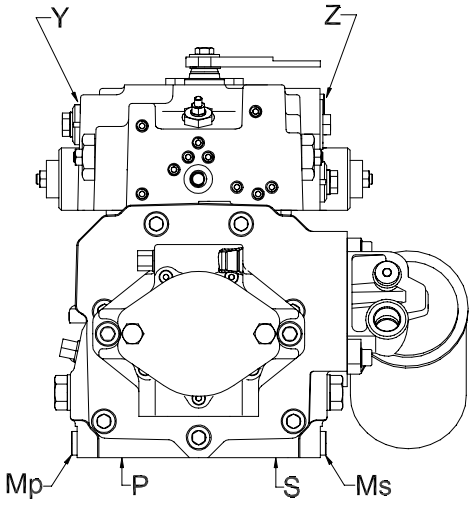
Tools / Equipment Required

- 0-600 psi △p-gauge (optional: two(2) 0-600 psi pressure gauges or transducers)
- 0-6000 psi pressure gauge or transducer
- 24mm wrench
- torque wrench capable of setting 150 N-m (111 ft-lb)
- regulation begin shims (refer to the Eaton spare parts catalog for part numbers)

Note: for shim set #2: 0.1mm shim change = 0.38° change in lever movement







⚠ WARNING

If performing this procedure on a vehicle, care must be taken. The pump will be put on stroke during this procedure, hence the vehicle must be safely elevated to allow the function to free-wheel. If this is not possible, then the pump workports "P" and "S" must be short circuited to each other to avoid movement of the function.

Regulation Begin Adjustment for HPV Pumps with "M2P" (Mechanical-Hydraulic with POR) Controls

Procedure for Right-Hand (CW) Rotation

⚠ **Note**

Prior to performing this procedure, verify that the hydraulic neutral on the pump is correctly adjusted. Use the instructions on page 3 to check and adjust the hydraulic neutral setting if required.

Adjustment Procedure for Right-Hand (CW) Rotation Pumps:

1. Install the 0-600 psi △p-gauge into port "Y" and "Z" ("HI" side into "Y" and "LO" side into "Z").
2. Install the 0-6000 psi gauge into port "Mp".
3. Set the input speed to operational speed.
4. While simultaneously monitoring both gauges, slowly turn the cam lever CCW (as illustrated on page 42). Record the pressure on the △p-gauge when you first see pressure at port "Mp". This is the regulation begin pressure for workport "P".
5. To adjust the regulation begin pressure:
   a. Remove End Plug #2 with the 24mm wrench.
   b. Add shims to Shim Set #2 to INCREASE the regulation begin setting, or remove shims to DECREASE the regulation begin setting.

   Note: You may need to add or remove shims to or from Shim Set #1 if you cannot acquire the desired regulation begin pressure by changing shims from Shim Set #2.

   c. Reinstall End Plug #2 and torque it to 150 N-m (111 ft-lb).
6. Repeat steps #4 and #5 until the desired regulation begin pressure is acquired.
7. Install the 0-600 psi △p-gauge into ports "Z" and "Y" ("HI" side into "Z" and "LO" side into "Y").
8. Install the 0-6000 psi gauge into port "Ms".
9. Set the input speed to operational speed.
10. While simultaneously monitoring both gauges, slowly turn the cam lever CW (as illustrated on page 42). Record the pressure on the △p-gauge when you first see pressure at port "Ms". This is the regulation begin pressure for workport "S".
11. To adjust the regulation begin pressure:
    a. Remove End Plug #1 with the 24mm wrench.
    b. Add shims to Shim Set #2 to INCREASE the regulation begin setting, or remove shims to DECREASE the regulation begin setting.

    Note: You may need to add or remove shims to or from Shim Set #1 if you cannot acquire the desired regulation begin pressure by changing shims from Shim Set #2.

    c. Reinstall End Plug #1 and torque it to 150 N-m (111 ft-lb).
12. Repeat steps #10 and #11 until the desired regulation begin pressure is acquired.

Regulation Begin Adjustment for HPV Pump with M2P (Mechanical-Hydraulic with POR) Controls

Procedure for Left-Hand (CCW) Rotation

⚠ **Note**

Prior to performing this procedure, verify that the hydraulic neutral on the pump is correctly adjusted. Use the instructions on page 3 to check and adjust the hydraulic neutral setting if required.

Adjustment Procedure for Left-Hand (CCW) Rotation Pumps:

1. Install the 0-600 psi △p-gauge into ports "Y" and "Z" ("HI" side into "Y" and "LO" side into "Z").
2. Install the 0-6000 psi gauge into port "Ms".
3. Set the input speed to operational speed.
4. While simultaneously monitoring both gauges, slowly turn the cam lever CCW (as illustrated on page 42). Record the pressure on the △p-gauge when you first see pressure at port "Ms". This is the regulation begin pressure for workport "S".
5. To adjust the regulation begin pressure:
   a. Remove End Plug #2 with the 24mm wrench.
   b. Add shims to Shim Set #2 to INCREASE the regulation begin setting, or remove shims to DECREASE the regulation begin setting.

   Note: You may need to add or remove shims to or from Shim Set #1 if you cannot acquire the desired regulation begin pressure by changing shims from Shim Set #2.

   c. Reinstall End Plug #2 and torque it to 150 N-m (111 ft-lb).
6. Repeat steps #4 and #5 until the desired regulation begin pressure is acquired
7. Install the 0-600 psi △p-gauge into ports "Z" and "Y" ("HI" side into "Z" and "LO" side into "Y").
8. Install the 0-6000 psi gauge into port "Mp".
9. Set the input speed to operational speed.
10. While simultaneously monitoring both gauges, slowly turn the cam lever CW (as illustrated on page 42). Record the pressure on the △p-gauge when you first see pressure at port "Mp". This is the regulation begin pressure for workport "P".
11. To adjust the regulation begin pressure:
    a. Remove End Plug #1 with the 24mm wrench.
    b. Add shims to Shim Set #2 to INCREASE the regulation begin setting, or remove shims to DECREASE the regulation begin setting.

    Note: You may need to add or remove shims to or from Shim Set #1 if you cannot acquire the desired regulation begin pressure by changing shims from Shim Set #2.

    c. Reinstall End Plug #1 and torque it to 150 N-m (111 ft-lb).
12. Repeat steps #10 and #11 until the desired regulation begin pressure is acquired.

Cold Start Valve Adjustment for HPV Pump with CA Control

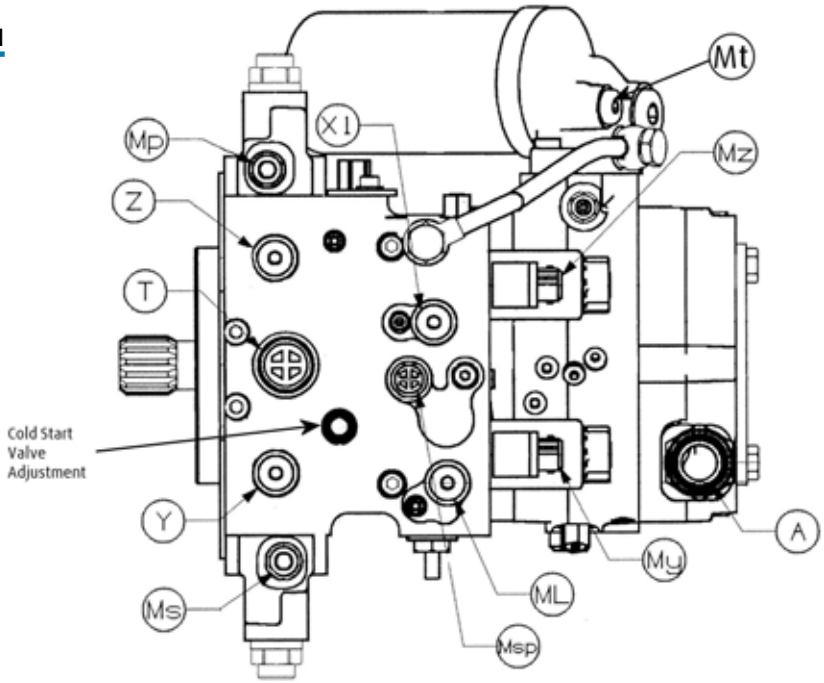
Set Up and Procedure

⚠ Important

This procedure is intended for field adjustments only.

Tools / Equipment Required

- 0-600psi Pressure Gauge.
- 10mm wrench (X2)



Adjusting the Cold Start Valve

Important

⚠ Vehicle's drive system must be kept in Neutral throughout this procedure. In order to insure this condition, it is recommended to disconnect both My and Mz solenoid connections.

This test must be performed with the oil at operating temperature.

1. Install the 0-600psi Gauge on test port "Mt" of the pump's filter block.
2. While monitoring the pressure on the "Mt" port.
   a. Increase the Engine RPM from the low idle all the way to max RPM.
   b. The pressure value at port "Mt" during max RPM is the Cold Start Valve setting. Contact Eaton Engineering for the correct value for your pump.

DANGER

In order to prevent damages to the filter element, this value must be kept lower than 580psi

3. To adjust the Cold Start Valve setting:
   a. Loosen the lock nut while holding the adjustment stud in place
   b. Turn the adjustment in to increase the Cold Start Valve setting.
   c. Turn the adjustment out to decrease the Cold Start Valve setting.
   d. Tighten the lock nut while holding the adjustment stud in place.

D3.1 Variable Orifice Adjustment for HPV with CA Control (Regulation Begin Setting)

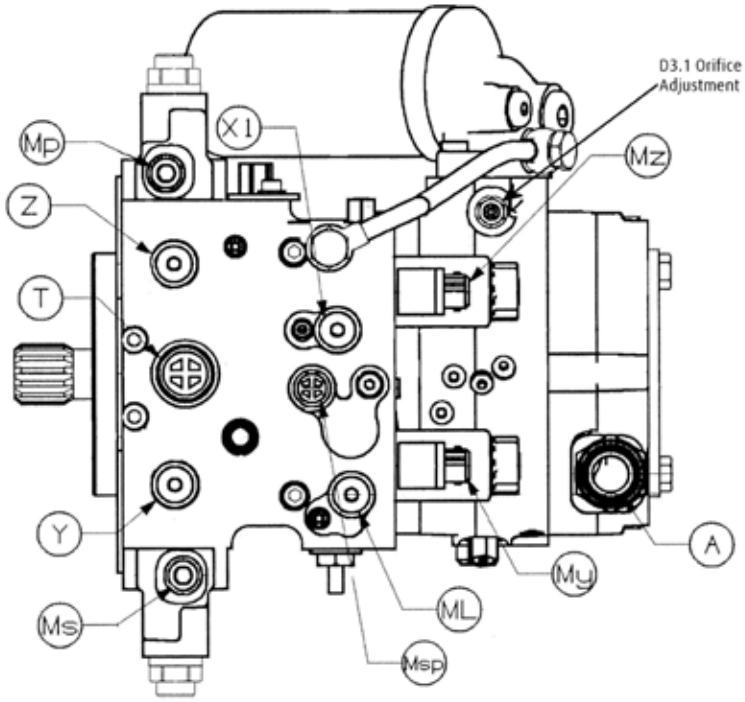
Set Up and Procedure

⚠ Important

This procedure is intended for field adjustments only.

Tools / Equipment Required

- Engine RPM Tachometer.
- 13mm wrench
- 4mm Allen key



Adjusting D3.1 Variable Orifice:

Important

⚠ Eaton recommends that the vehicle be lifted off the ground throughout this procedure.

This test must be performed with the oil at operating temperature.

DANGER

The HPVCA pump will be put on stroke during this procedure; as a result, the vehicle's propel motor(s) will be turning while measurements / adjustments are taking place.

1. While monitoring the Engine RPM, slowly increase the Engine RPM until the vehicle's propel motor(s) start to rotate.
2. Record the Engine RPM at which the propel motor(s) started their rotation. This RPM Value is the pump's regulation begin RPM and must match the value specified for the vehicle. Contact Eaton Engineering for this value
3. To adjust the D3.1 variable orifice setting:
   a. Loosen the lock nut while holding the adjustment stud in place
   b. Turn the adjustment in to decrease the Regulation Begin RPM Setting.
   c. Turn the adjustment out to increase the Regulation Begin RPM Setting.
   d. Tighten the lock nut while holding the adjustment stud in place.

Power Limiter Valve Adjustment for HPV Pump with CA Control

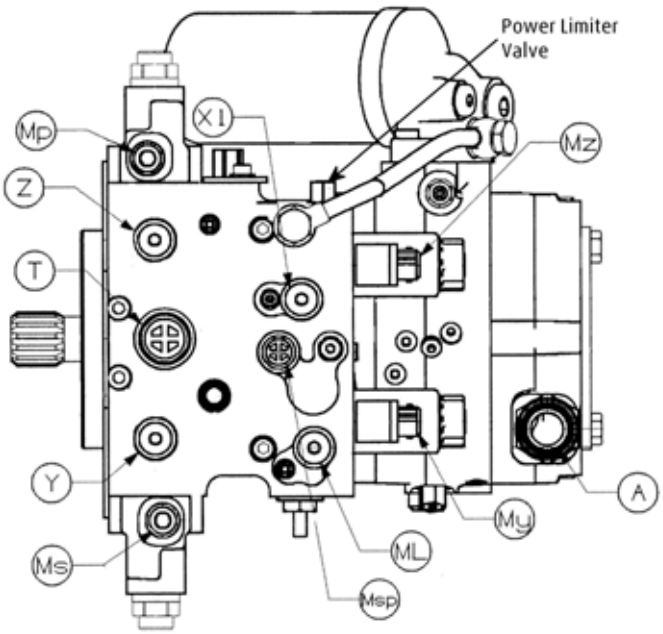
Set Up and Procedure

⚠ Important

This procedure is intended for field adjustments only.

Tools / Equipment Required

- 0-600psi Differential Pressure Gauge.
- 11mm wrench
- 10mm Wrench
- 3mm Allen Key



Adjusting the Power Limiter Valve

Important

⚠ Vehicle's drive system must be kept in Neutral throughout this procedure. In order to insure this condition, it is recommended to disconnect both My and Mz solenoid connections.

This test must be performed with the oil at operating temperature.

1. Install the 0-600psi Differential Gauge as follows:
   a. Connect the HI side to the "ML" port
   b. Connect the LO side to the "Msp" port.
2. While monitoring the pressure on the Differential Gauge:
   a. Increase the Engine RPM from the low idle all the way to max RPM.
   b. The pressure value on the Differential Gauge during max RPM is the Power Limiter Valve setting. Contact Eaton Engineering for this value.
3. To adjust the Power Limiter Valve setting:
   a Loosen the lock nut while holding the adjustment stud in place
   b Crack open the upper part of the power limiter valve body while holding the adjustment stud in place.

DANGER

Do not move this portion of the valve body more than 1/8 of a turn. Excessive movement can result in disassembly of the valve.

   c. While holding the Valve body in place, turn the adjustment in to increase the Power Limiter Valve setting, or out to decrease it.
   d. Tighten the upper part of the Power Limiter valve while holding the adjustment stud in place.
   e. Tighten the lock nut while holding the adjustment stud in place.

Switching Valve Adjustment for HPV Pump with CA Control

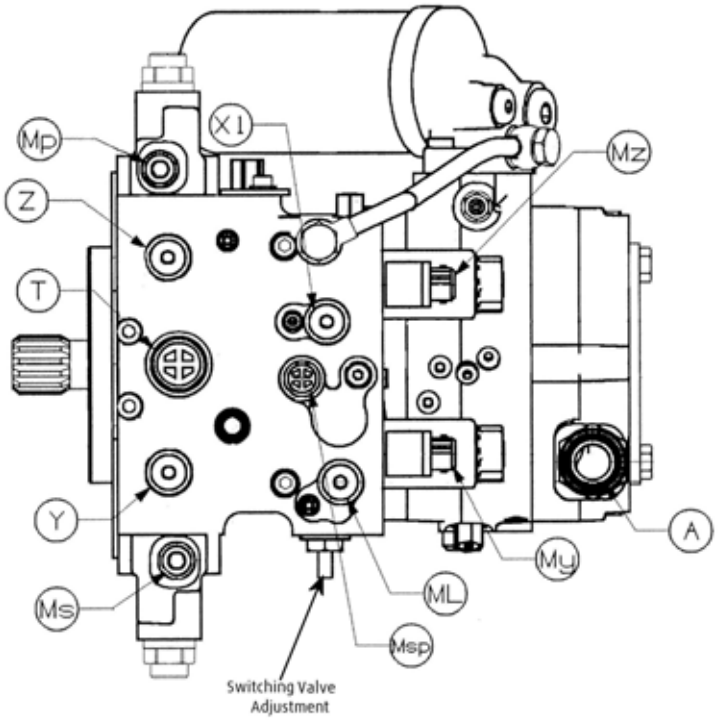
Set Up and Procedure

⚠ Important

This procedure is intended for field adjustments only.

Tools / Equipment Required

- 0-600psi Pressure Gauge.
- Engine RPM Tachometer.
- 13mm wrench
- 4mm Allen key



Adjusting the Switching Valve

Important

⚠ Eaton recommends that the vehicle be lifted off the ground throughout this procedure.

This test must be performed with the oil at operating temperature.

DANGER

The HPVCA pump will be put on stroke during this procedure; as a result, the vehicle's propel motor(s) will be turning while measurements / adjustments are taking place.

1. Install the 0-600psi Gauge on test port "Y" of the pump control.
2. With the vehicle lifted off the ground, Energize solenoid Mz.
3. While monitoring the Engine RPM and the pressure in port "Y":
   a. Slowly increase the Engine RPM from low idle.
   b. The pressure in port "Y" will increase as the Engine RPM increases, then will suddenly drop back to charge pressure.
   c. Record the Engine RPM when the pressure in port "Y" suddenly drops back to charge pressure.
4. This Engine RPM value must be equal to the mid point between "Engine low idle RPM" and "Pump's Regulation Begin Engine RPM" ± 20RPM (see page 46).
5. To adjust the Switching Valve Setting:
   a. Loosen the lock nut while holding the adjustment stud in place
   b. Turn the adjustment in to increase the Switching Valve value.
   c. Turn the adjustment out to decrease the Switching Valve value.
   d. Tighten the lock nut while holding the adjustment stud in place.

Additional Information

Environmental Concerns

Protection of the natural fundamentals of life is one of our predominant tasks. We are continuously improving the protection of the environment as far as applications are concerned. We encourage you to contribute your share to comply with this demand. In connection with work to be performed, the environmental regulations of the machine manufacturer must be respected.

In general:

- Greases and oils which cannot be used any more have to be collected. They are normally a threat to water reserves and must be kept away from the environment.
- Adhere to national and local regulations for waste disposal.

Important

You have been provided information on the conversion of DuraForce products. Proper application of the information requires specific training and may require use of specialized tooling and equipment. All requests for training must be coordinated through your Eaton Account Manager. He can also provide you price and availability of any specialized tooling. If you choose to proceed with the conversion of the DuraForce products absent the necessary training and/or these specialized tools, you do so at your risk.

Eaton will accept no claim for warranty resulting from deficiencies in the conversion. Please refer to the Eaton literature web site for warranty information at www.eaton.com/hydraulics/warranty.

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